MODERN PLASTICS

OCTOBER 1947

New Pages from the **DUREZ** *Diary* ★

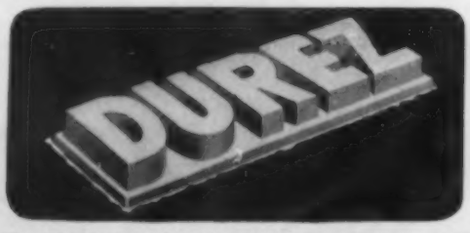
● In public buildings and at home you can walk without a care on a hard, transparent, easy-to-clean film of wax that protects the beauty and texture of flooring indefinitely.

It was not always thus. The wax coatings industry overcame many a problem to give building owners the low cost and long wear of modern floor finishes. During the war one raw material after another had to be supplemented, or even replaced entirely. So, like many other manufacturers, the floor wax people turned to Durez phenolic resins technicians for aid.

Aid came fast through a Durez division working exclusively in the field of protective and decorative coatings. We developed first one, then a series of special phenolic resins compatible with available basic waxes. These are now widely used to make beautiful, glossy, harder finishes that show less wear than ever, clean more easily.

Floor finishes are more waterproof, their manufacture has been simplified, and production costs have been lowered through the use of Durez resins. Also, they stay fresh and usable... aging on the shelf does not thicken them or develop other physical changes.

The beneficial effects of Durez resins are by no means confined to floor finishes. Today's improved paints, varnishes, lacquers, and printing inks embody the 26 years of Durez experience as specialists in the phenolics. Durez Plastics & Chemicals, Inc., 510 Walck Road, North Tonawanda, N. Y.



PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC RESINS THAT FIT THE JOB

TIME TELLS... *Catalin* SELLS!

There are many plastics, but there is only *one* Catalin — *the gem of plastics!* Down through the years hundreds of new materials have made their appearance, yet within its own sphere Catalin remains supreme. Catalin adapts itself perfectly to modern styling, its color has a natural flowing texture that can only be obtained by the casting process through which it is produced . . . deep, rich, satisfying color that is an intrinsic part of the material . . . unrivalled lustre and brilliance, and a charm of surface that will forever remain radiant and enchanting.

Clocks cased in Catalin become distinguished accessories to gracious living, always exquisitely correct, with a style and beauty as up-to-the-minute as the time on the dial. Book ends, desk and table pieces, and a host of other appointments that add color and charm to the home, when cloaked in Catalin bring an enduring pride in ownership . . . the most commonplace object becomes a treasured possession.

In the field of beauty, the range of Catalin is limitless! For this reason the scope of Catalin continues steadily to increase. Highly developed casting techniques now make it possible for product designers to plan freely in all three dimensions. Tooling costs are low, without recourse to expensive custom mold costs. No other thermosetting material can match its rich flowing color or speed of availability.

With an allure rivalling that of rare and semi-precious stone, Catalin gives your product a *desirability* that will add immeasurably to its sales appeal. A get-together with our service staff will quickly reveal how you can plan *telling selling* with Catalin. Inquiries invited!

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

Fabricated by Creative Plastics, 963 Kent Ave., B'klyn, N.Y.

CATALIN
THE GEM OF PLASTICS
Catalin

CAST RESINS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS

VOLUME 25 OCTOBER 1947 NUMBER 2

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To help you select the right material for your product

Geon

GEON is the name used to designate a group of thermoplastic resins which impart to finished products such properties as resistance to water, chemicals, abrasion, sun, mildew and most other normally destructive factors. GEON can be pressure or injection molded, extruded, calendered or cast into sheet or film. It is available in powder, paste-forming resin, polyblend (GEON-HYCAR) and latex forms. Products made from GEON may be brilliantly or delicately colored. The suitcase shown here is an example of a product made from calendered sheet.

KRISTON

KRISTON designates a group of thermosetting resins with many unusual properties. Products made from KRISTON may have excellent optical properties, unusually good electrical properties plus resistance to most normally destructive factors. As the clock at the left shows, products made from KRISTON can be most decorative in this and other forms such as jewelry, buckles, buttons, frames, desk sets, coasters, ash trays and many others. KRISTON is a relatively new product, and we invite suggestions and inquiries as to possible applications.

Hycar

HYCAR is the name applied to a group of American rubbers that have found wide usage in both consumer and industrial products. Typical are the household items shown at right which, like other products made from HYCAR, resist water, grease and oil, heat, aging, abrasion and many other destructive factors. HYCAR OR-15 is exceptionally oil resistant, and is an important material in the oil fields as well as in general industry. HYCAR and GEON may be blended for certain uses to impart to finished products the most favorable properties of each. (Products courtesy of Wooster Rubber Co., Wooster, Ohio.)

Good-rite

GOOD-RITE is the brand name of a constantly growing group of widely diversified chemicals. GOOD-RITE Erie, for example, is one of several outstanding chemicals for the rubber industry. GOOD-RITE p.e.p.s. is a new fungicide that promises great things for the future in agriculture. And there is a large group of intermediate organic chemicals which are finding new uses daily. The GOOD-RITE name is growing, and is certain to become an important one in many different industries.

We make no finished products from any of these raw materials. But we will be glad to work with you on any special problems or applications. For more information, or for an informative glossary of technical terms used in the Plastics and Rubber Industries, please write Department O-10, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals are registered trade marks

BOTH INJECTION MOLDED...

Both Chicago Molded

Here are two extremes . . . two widely divergent examples of injection molded plastics jobs recently produced by CMPC. We hope they give you an idea . . . first, an idea of the scope of our facilities . . . our ability to produce fine injection molded parts, in any quantity, and in an extremely wide range of sizes. Perhaps they'll also give you an idea of the quality of our work, for neither Zenith nor Westclox would OK anything but tops in quality, and they're both old customers of ours.

Illustration shows the cabinet for the new Zenith "Holiday" portable radio injection molded of gleaming maroon polystyrene. The little fellow at the left is a Westclox knob . . . ¾" in diameter . . . molded of ivory polystyrene with a metal insert.

Of course, injection molding is just one phase of our business. Our compression molding department is equally large and is equipped with every needed size and type of press to insure maximum molding efficiency and economy in the production of any job.

And . . . our experience in product development . . . working closely with our customers in design and engineering . . . includes the pioneering of many famous "firsts."

CHICAGO MOLDED PRODUCTS CORPORATION

Hundreds of America's leaders of industry have found CMPC a good place to come for the best in molded plastics . . . a dependable source of sound, practical advice and economical production. They like it . . . and they come back for more.

If you're looking for such a molder, we suggest you phone or write today. A discussion of your problems will involve no obligation and may lead to their satisfactory solution.

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A lesson in salesmanship

One of the best promotion jobs ever done for the plastics industry is the Plastics in the Home issue of the October *House Beautiful* magazine. Under the supervision of Marion Gough, Textiles and Features Editor of that magazine, the staff has put together an entertaining, informative, factual and most attractive presentation of all types of plastics materials that may be used in the home. While stressing the value and beauty of plastics, the editors have pulled no punches, made no extravagant claims. They have given their readers a down-to-earth appraisal of what to expect from plastics products and how to use them. It is worth emphasizing again that the editors have been meticulous in pointing out that plastics are not miracle materials, but simply other materials which can be advantageously applied to certain uses.

The keynote of the entire presentation is the statement that "Plastics are neither miracles nor junk, but they can improve your life a thousandfold *if* you know what to expect of them . . . there is hardly a human endeavor, from shipbuilding to keeping house, where they can't improve performance and appearance . . . but what plastics need at this point is a lot less miracle talk and a whole lot more understanding . . . they need more well-informed critics who refuse to condemn all plastics because some have failed."

The chart which explains the differences in plastics materials is worth careful study and emulation on an enlarged scale wherever an opportunity can be found for such presentation. The sketch, "They laughed when I said methyl methacrylate," will make the bluenoses bluer. But for a down-to-earth commentary on the public's attitude toward plastics, it is an amusing contribution on nomenclature and plastics misapplications.

The principal point we want to make here is that this is a plastics promotion job of superlative quality by an outside source. There could scarcely be a better type of promotion, but it is a bit humiliating to realize that it required an outsider to show the industry "how to do it!"

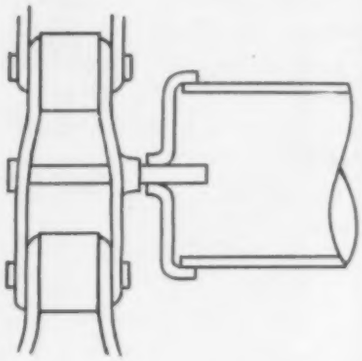
Few persons can realize the amount of time, effort and cost that was expended in this enterprise which has been in the making for over six months. The result is a manual that may be profitably placed in the hands of every retail sales person in the United States who deals in plastics materials.

May we be so bold as to suggest that the industry study this type of informative literature, that it adopt some form of cooperative action whereby it may repeat *and* repeat *and* repeat a sensible and sound story that will tell the simple truths about plastics. It can't be done without expenditure of time and money—it will require thoughtful and cooperative planning. Certainly the experiences of the past six months should be enough to warn this industry that an unenlightened customer is no customer at all.

Problems solved by Richardson...in Plastics

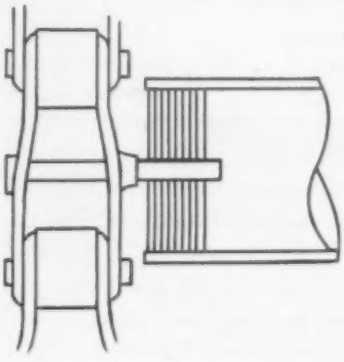
#3--NON-CORRODING BEARING ON POTATO WASHING MACHINE

PROBLEM: Galvanized rollers must gently move and rotate potatoes through a washing operation without damage. Roller assembly consisted of a tube with a stamped metal cap welded on each end which served as the bearing. Water was always present which corroded both cap and conveyor pin. Corrosion, plus the metal-to-metal contact, resulted in excessive wear of both parts. This caused misalignment, creating a sliding action of the roller on the rails. The final result was improper washing of the potatoes as well as increased power demands.



SOLUTION: The stamped metal cap was replaced by a disc of Laminated INSUROK, Grade CG which was press-fitted into the roller. Result . . .

(1) Welding operation eliminated.
(2) INSUROK disc greatly increased the bearing area, giving better support to the roller.
(3) Friction greatly reduced because of the characteristics of INSUROK Grade CG.
(4) Greatly lessened power load.
(5) Wear on conveyor pin and bearing practically eliminated.
(6) The rollers rotate in a parallel plane, resulting in a better washing operation.



INSUROK *Precision Plastics*

INSUROK is the family name of a great variety of laminated and molded plastic products produced by Richardson. Laminated INSUROK is available in sheets, rods, tubes, punched and machined parts, made with paper, fabric, glass, etc. Molded INSUROK products are made from Beetle, Bakelite, Plaskon, Tenite, Styron, Durez, Lucite, etc., by compression, injection and transfer molding.

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RICHARDSON MEANS *Versatility* IN PLASTICS

News about Du Pont Plastics

NEW! Phosphorescent "Lucite"

glows in the dark up to 12 hours after exposure to ordinary light. Phosphorescent "Lucite" comes in sheeting only slightly higher in cost than the regular types and has all the excellent properties of standard "Lucite." It's shatter-resistant... easily machined... has rugged endurance outdoors. Uses: advertising and directional signs, light switches and exit signs, dial faces for instruments, radio and telephone sets.

NEW! Patterned "Lucite"

acrylic resin gives designers new opportunities for creating more salable plastic products. It is supplied in a variety of frosted, pebbled and other surface finishes. Patterned "Lucite" has the same properties as the smooth-finished "Lucite"—including resistance to shattering and weathering, strength and light weight. Salad, fruit and flower bowls, trays, cigarette and candy boxes, lamp bases and many other items made of patterned "Lucite" are already in commercial production. In addition, the material offers a new avenue for design and application in the decorative, display and architectural fields.

NEW! Production Facilities

now under construction at Washington, West Virginia, will supplement Du Pont plastics production at Arlington, N. J. This will be a large new plant for producing Du Pont

nylon, polythene, and "Lucite" acrylic resin—assuring the continued expansion of the wide range of products made from Du Pont plastics.

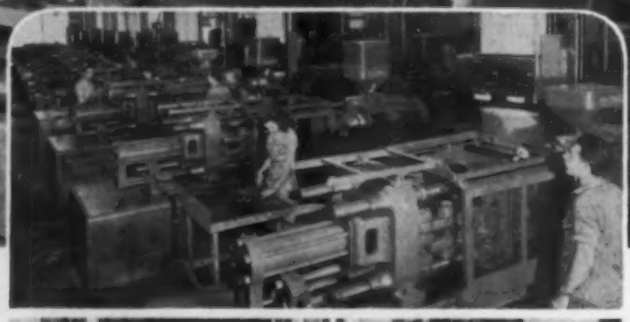
For thrilling entertainment, tune in Du Pont "Cavalcade of America"—Mondays, 8 P. M. EST, NBC.

NEW! Price Reductions

of Du Pont plastics! In line with Du Pont's standard policy of lowering prices as production economies permit, three types of "Lucite" molding powder are reduced from 85¢ to 70¢ a pound, and three others from 85¢ to 65¢ a pound in 2000-lb. lots. And although demand still exceeds supply, prices of Du Pont polythene have been reduced for the fourth time since 1943.

DU PONT
REG. U.S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

Need sales stimulation? Be sure to investigate the possibilities of Du Pont plastics. They have added new usefulness, new beauty, and increased salability to hundreds of products. **Write for booklet today:** E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Room 3610, Arlington, N. J.



Consistent PREFERENCE and PROGRESS!

HERE'S PROOF that's positive! Since 1941, The Ideal Novelty & Toy Company has steadily added to their equipment until they now operate a battery of 30 Reed-Prentice plastic injection machines in their new and modern plant at Hollis, N. Y. (See installation views).

Twenty-four of these machines are the popular 10D-8 Oz. capacity . . . *all of them* are busy at peak production, molding toys, dolls and novelties of all descriptions.

Further proof of continued preference for Reed-Prentice equipment is shown by orders from this progressive molder for additional machines . . . including the 10H-22 Oz. model.

Wherever you find Reed-Prentice injection molding machines . . . and there are over 1500 in use all over the World . . . you'll find this same confidence in their unexcelled, dependable performance, freedom from shut-downs, low maintenance cost and extreme versatility.

When you are interested in injection molding, write Dept. D for complete mold and machine information. Machines are available in 4, 8, 10, 12, 16 and 22 Oz. capacities.

THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

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CELCON* is good and TOUGH!

Celcon—hot or cold—is always tough. It's a cellulosic—the overall toughest plastics group in use today.

Celcon, Celanese ethyl cellulose . . .

- Molds fast, accurately, smoothly
- Machines without stress crazing
- Is ideal with metal cores and inserts
- Can be drilled without weakening of part
- Requires no finishing
- Installs without breakage
- Is odorless, tasteless, non-toxic
- Is available in a full color range

If you have a product that is headed for a rugged life, find out from a Celanese representative what Celcon can do to make that product tough and strong and handsome—and economical to produce.
Celanese Plastics Corporation, Dept. D-1, division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y.

Freezer Frame for Westinghouse Refrigerator. Injection molded from Celcon by Standard Products Company, Detroit, Michigan.

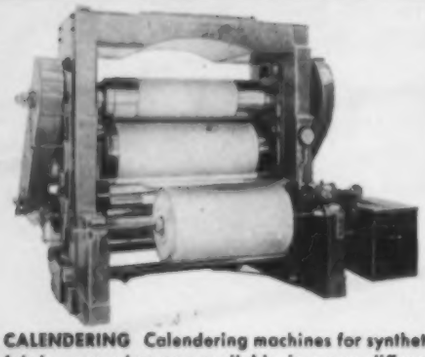
*Reg. U. S. Pat. Off.

Celanese* Plastics

LUMARITH* FORTICEL*
CELCON* CELLULOID*

How you can save MACHINE DESIGNING COST for SYNTHETIC FABRIC PROCESSING

TUBING MACHINE Constant speed tubes can be operated up to 200 yards per minute. Movable carriage facilities selvage alignment. Speed is constant at all times and adjustable tension arrangement is provided. Accurate measuring obobtainable. Interleafing attachments.



CALENDERING Calendering machines for synthetic fabric processing are available in many different types and all tonnages. These machines work exceptionally well for chloride monofilms and Saran. All designed for cold or hot calendering.

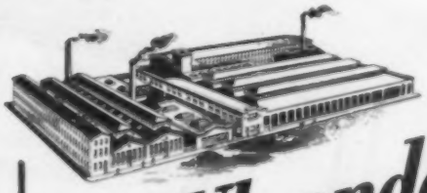
EXPANDER Expanders are available in many different types for keeping rolls of material free of wrinkling. One or more expanders can be installed on practically all types of finishing machines to facilitate handling at take-ups or let-off end of rolls.

CALENDERING
EMBOSSING
DRYING
SHEETING

For many years, we have been the world's largest manufacturers of machinery for the textile industry. Many of our machines for calendering, embossing, drying, coating, roll-up and tubing are ideal for processing synthetic fabrics.

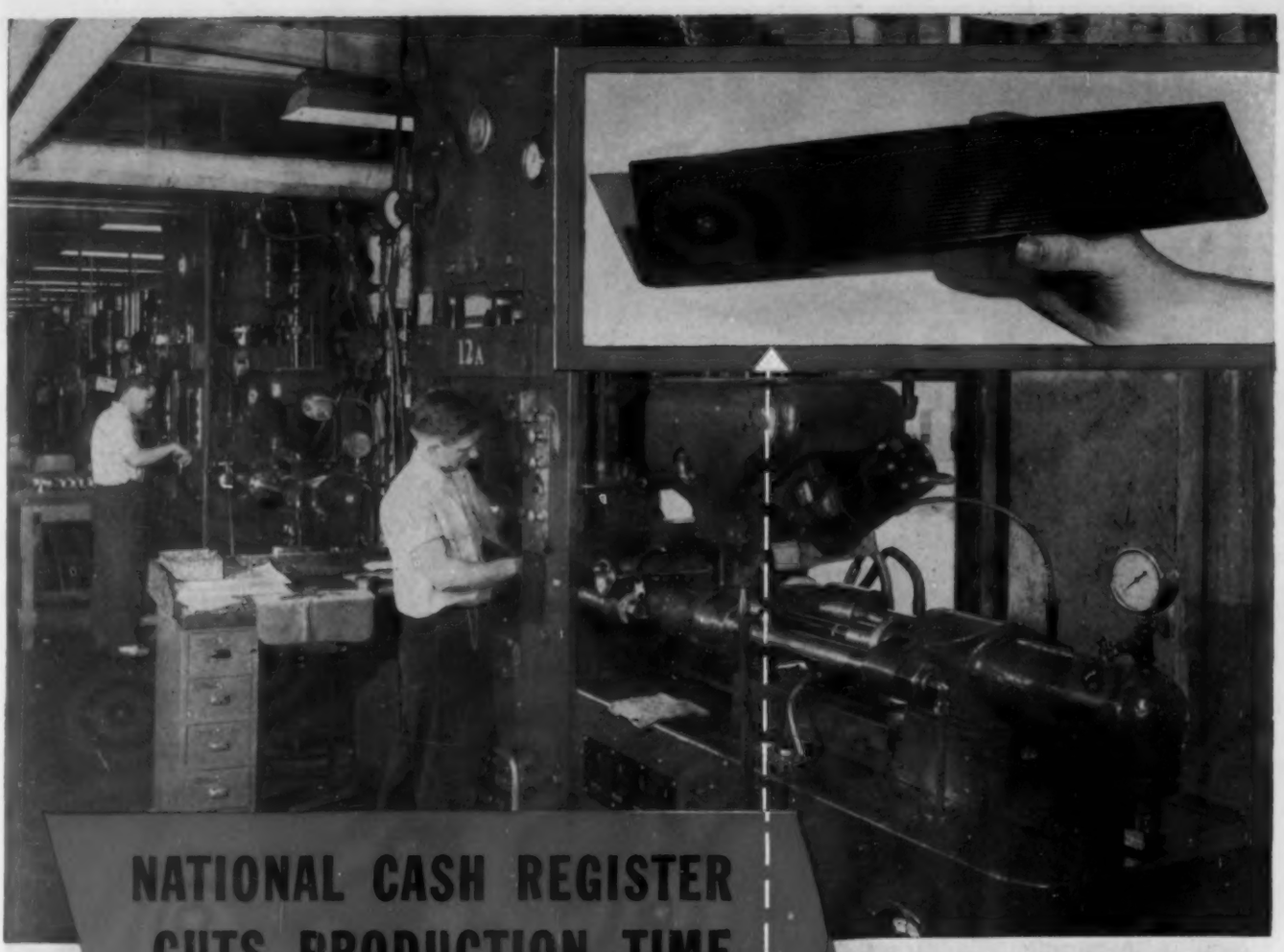
By utilizing all our past experience, design skill and manufacturing facilities, you can get your processing operations under way faster and at lower cost than if you were to begin designing and manufacturing special equipment.

If you have a specific problem, why not contact us first with the thought of utilizing existing designs for synthetic fabric processing.



Van Vlaanderen
MACHINE COMPANY
370 Straight Street, Paterson, New Jersey

BLEACHERS • BREAKERS • CALENDERS • CALENDER DRYERS • CONTINUOUS WASHERS • COOLING CYLINDERS • COTTON BACK FINISHER DRYERS — ALL TYPES • DYEING MACHINES • ELECTRIC GUIDERS • EMBOSSING MACHINES • EXPANDERS • EXTRACTORS • FLOCK PRINTING MACHINES • GLASS CLOTH HANDLING EQUIPMENT • HEATING TOWERS • HYDRAULIC CALENDERS • IMPREGNATING MACHINES • MANGLES • MEASURING MACHINES • MIXING KETTLES • PAD DYEING MACHINES • PRINT WASHERS • ROLLING-UP MACHINES • ROLLS — RUBBER — PAPER • SINGEING MACHINES • SLACK PRINT WASHERS • SOAP WASHING MACHINES • SQUEEZERS • SUCTION MACHINES • TENSIONLESS CONSTANT SPEED DYE JIGS • TENTER FRAMES • TUBING MACHINES • WINDERS •



NATIONAL CASH REGISTER CUTS PRODUCTION TIME On This Part

Molding time was sharply reduced when National Cash Register substituted these 4-oz. H-P-M injection molding machines, with vertical clamps for compression presses, on this 3¼-oz. part.

With H-P-M All-Hydraulic Injection Molding Machines

When thermo-setting plastics for compression molding became in "short" supply, National Cash Register switched to thermo-plastics and H-P-M injection molding machines. It was a blessing in disguise—for production time on one item alone—fronts for cash register drawers—dropped 75%.

TAKE A TIP FROM NATIONAL. Look over *your* list of parts now molded on compression presses. Then investigate the possibilities in H-P-M injection molding machines—for injection molding materials are plentiful . . . It's an idea worth investigating!

Fast, money-saving H-P-M injection molding machines are built in five standard sizes—4, 9, 12, 16 and 32-ounce capacities. Regardless of your plastics problem, an H-P-M engineer can be of real service to you. Call in your nearest H-P-M representative or write direct.

Get quick, factual information on H-P-M 4-oz. machines by writing today for bulletin 1010.

THE HYDRAULIC PRESS MFG. COMPANY, 1010 Marion Road, Mount Gilead, Ohio, U. S. A.

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HPM

All-Hydraulic Self-Contained **Plastics Molding Presses**

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

TO ATTAIN excellence in plastic molding, many steps—each an essential part of the whole process—must be followed through accurately and thoroughly.
Every step of the way—designing, mold making, molding, and finishing—calls for the highest skill and experience, plus the proper plant facilities for efficient production. Combined, these operations can result in quality molding... plastics that "measure up" in performance, appearance and cost.
MACK experience and proven methods, plus three completely equipped plants, offer plastic molding that qualifies. Your inquiries are solicited; address Mack Molding Company, Inc., 100 Main Street, Wayne, N. J.
mack
MOLDED EXCELLENCE
M
MACK PLANT AT WATERLOO, P. Q., CANADA
MACK PLANT AT ARLINGTON, VERMONT
MACK PLANT AT WAYNE, NEW JERSEY

THE CARVER LABORATORY PRESS

Standard for Research and Development

Photographs and identification cards displayed on the top shelf were permanently laminated between transparent acetate sheets on the Carver Laminating Press, another Carver product.

A few of the many useful applications of . . . .

CLP's

Samples produced on the Carver Laboratory Press are shown in this display case. These exhibits represent only a few of many hundreds of uses for CLP's. Laboratory samples included here are listed by shelf number:

No. 1 Metallographic Mountings; Molded Pieces with Metal Inserts; Powder Metallurgy.

No. 2 Plastic Molding (Thermosetting and Thermoplastic); Lamination Tests; Molded Rubber (synthetic and natural); Molded Color Samples.

No. 3 Pressed Oil Samples and Pressed Extracts; Extrusion Tests; Adhesive (bonding) Tests; Bonded Plywood Tests.

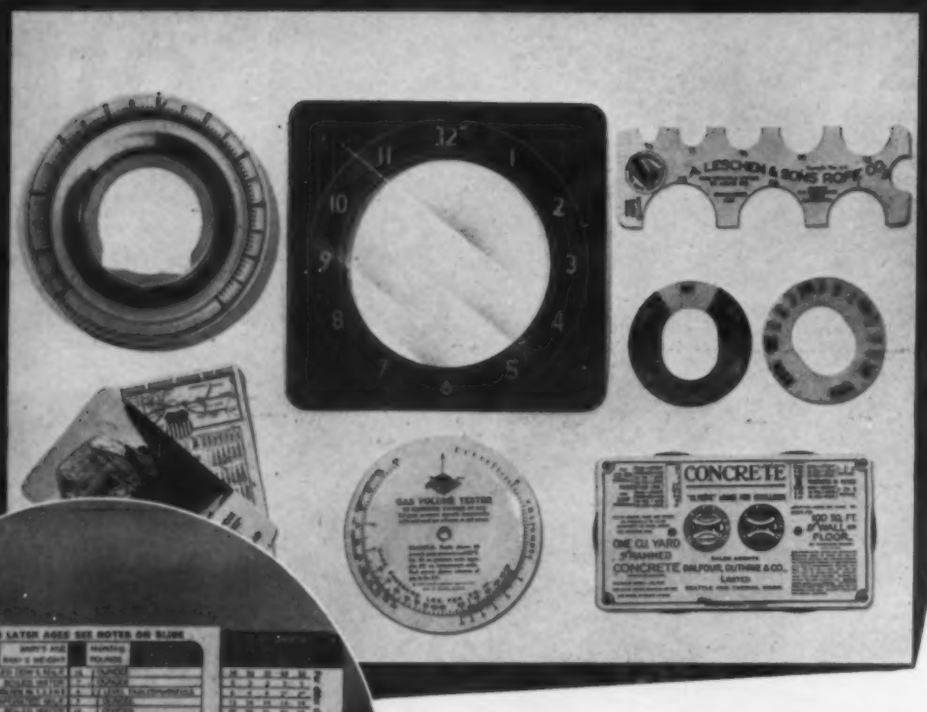
No. 4 Pressed Cake Samples (after oil is pressed out); Briquetting; Breaking and Crushing Tests.

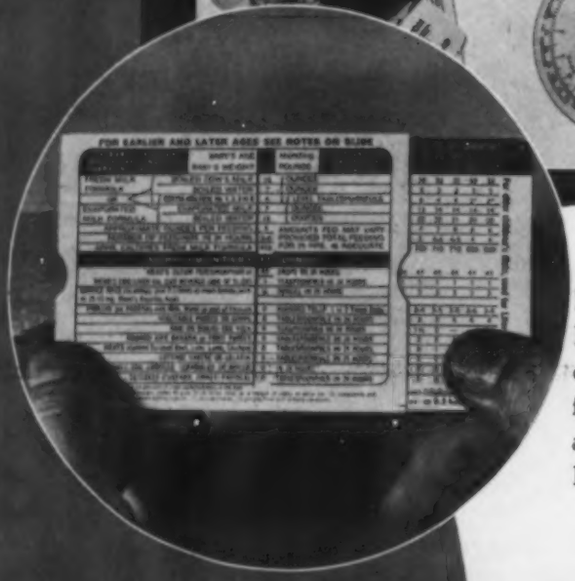
The Carver Laboratory Press is invaluable for development, research and instruction work; testing single cavity molds; preparation of samples; etc. The Carver Press is a complete, self-contained hydraulic unit. Accurately controlled pressures to 20,000 lbs.; 6-inch gauge mounted on base. Carver Standard Accessories include Electric or Steam Hot Plates, Carver Test Cylinders, Swivel Bearing Plates, Cage Equipment. Available from stock. Write for catalog.

FOR QUICK-ACCURATE-SMALL SCALE TESTS
THE CARVER LABORATORY PRESS

FRED S. CARVER INC.
HYDRAULIC EQUIPMENT
343 HUDSON ST. NEW YORK 14, N. Y.

PLASTICS for INDUSTRY





CREATIVE CUSTOM FABRICATING

Fabricating of articles from plastic sheet stock has been a specialty of Cruver's for many years. As one of the pioneers in the United States in the plastics fabrication field we have produced for our customers a diversified line of products, a few of which are herewith illustrated.

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Cruver

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GR-S — GR-N — GR-M

THE BAKER CASTOR OIL COMPANY

Established 1857

120 Broadway, New York 5, New York

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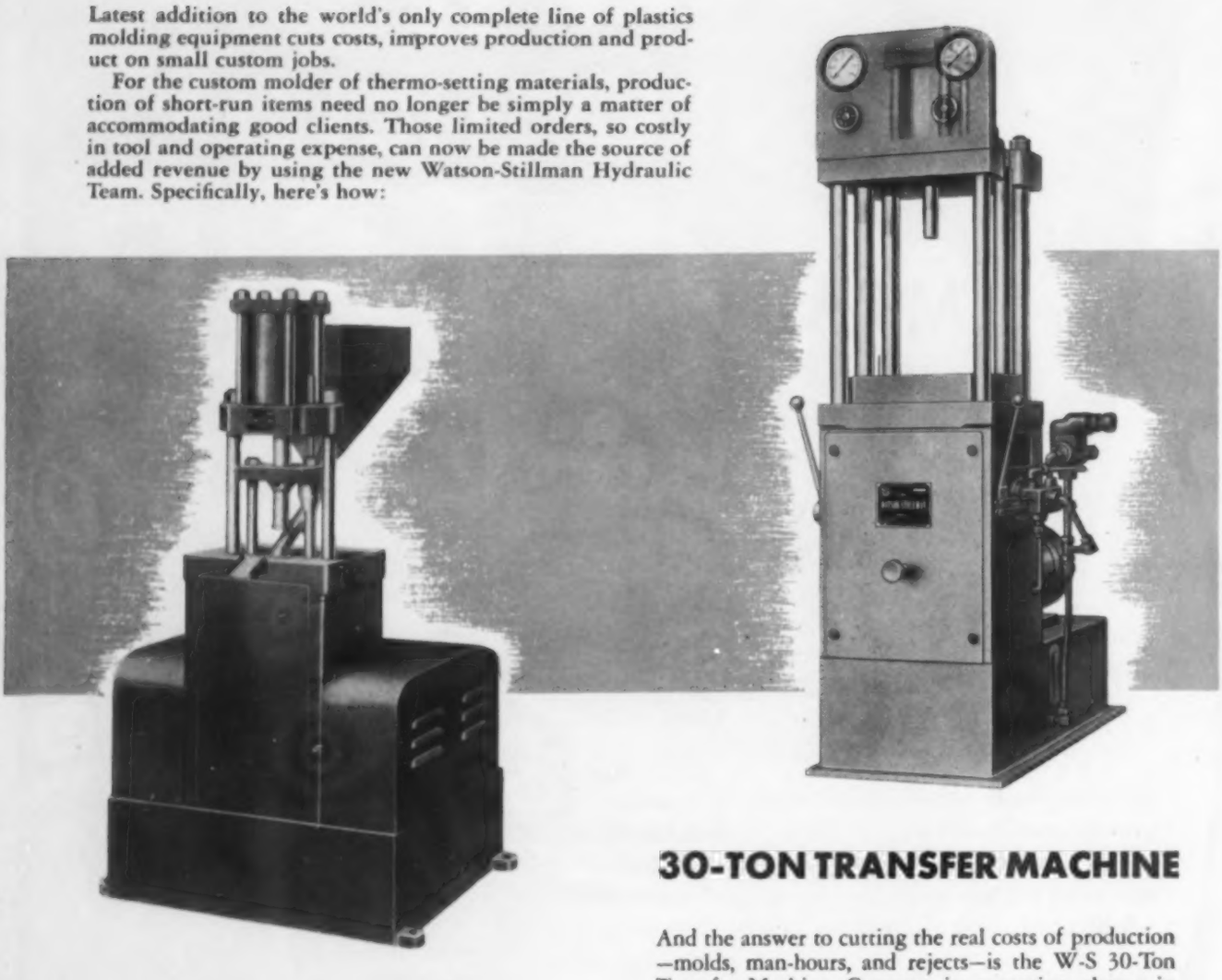
Make Your Short

Latest addition to the world's only complete line of plastics molding equipment cuts costs, improves production and product on small custom jobs.

For the custom molder of thermo-setting materials, production of short-run items need no longer be simply a matter of accommodating good clients. Those limited orders, so costly in tool and operating expense, can now be made the source of added revenue by using the new Watson-Stillman Hydraulic Team. Specifically, here's how:



10-TON TABLETING PRESS

Probably you employ high-frequency pre-heating and for the best results you'll want pre-forms of uniform and controlled density, produced at a rate comparable to that of mechanical pill-makers but without the higher initial cost and higher upkeep of those complicated machines.

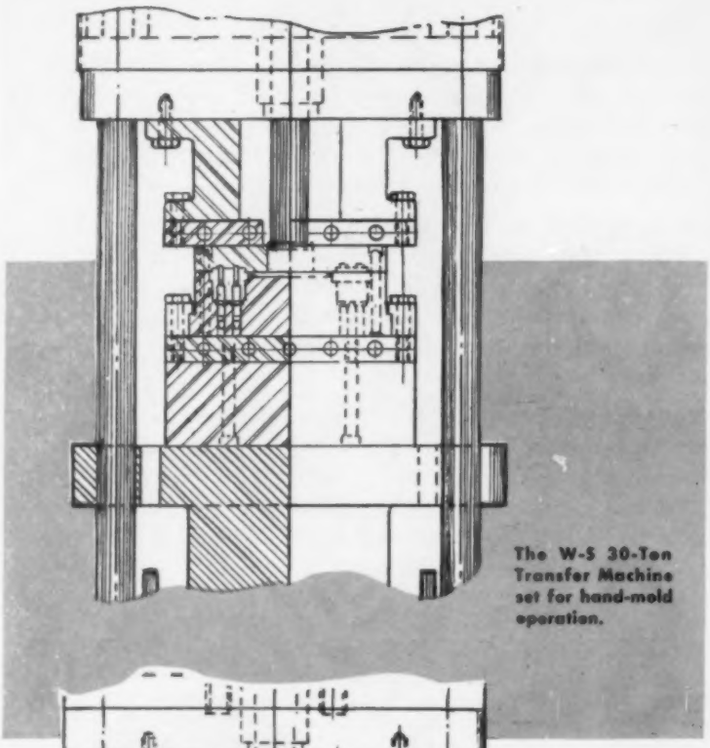
The answer is Watson-Stillman's new 10-Ton Tableting Press—fully hydraulic for safety, rapid set-up, and incredibly low cost maintenance of equipment and tools; a machine as simple as vanilla, fool-proof as a cynical policeman. Pressure is steplessly adjustable to suit the job at hand with a minimum power consumption... you adjust the pill size instantly, *while the machine is running*. And when your larger machines are tied up, the little W-S 10-ton is handy for moderate production of pills large enough for transfer machines up to 200 tons.

30-TON TRANSFER MACHINE

And the answer to cutting the real costs of production —molds, man-hours, and rejects—is the W-S 30-Ton Transfer Machine. Compare its operation, shown in **Figure 1,** with your present method of hand-mold production—notice the simple two-piece mold, the independently adjustable clamping and transfer rams that mean elimination of flash around parting line and inserts. Remember, too, that with this simple and inexpensive method you are enjoying all the advantages in product quality that ordinarily are associated only with the expensive, long-run method of automatic transfer molding... closer dimensions, better mechanical and dielectric properties, less strain on cores, more accurate location of inserts, and longer mold life than are possible with conventional compression molds or with three-piece transfer hand molds in a single-ram machine.

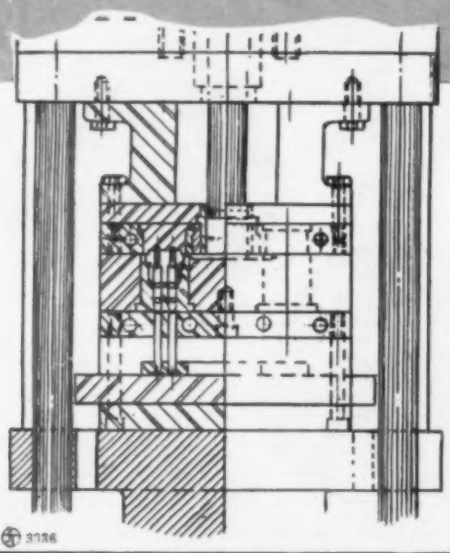
Figure 2 shows how easily the W-S 30-ton transfer press is converted to automatic multiple-cavity molding of a typical small part with dual inserts. **Figure 3** in the un-retouched photo (magnified) shows the clean parting line, the freedom from flash around the inserts that spell savings in finishing costs.

Runs Profitable



The W-S 30-Ton Transfer Machine set for hand-mold operation.

Unretouched photograph of a typical Transfer Molded part.



The W-S 30-Ton Transfer Machine set for automatic transfer molding.

WHY not discover how W-S COMPLETELINE Sales and Service can strengthen your competitive position? 99 years' experience building hydraulic machinery, plus a wealth of data collected by W-S plastics pioneers, are yours without obligation. Write today.

WATSON-STILLMAN

HYDRAULIC MACHINERY DIVISION

Established 1848

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MANUFACTURERS OF THE MOST COMPLETE LINE OF HYDRAULIC MACHINERY

Millions of knobs to prove one thing about plastics

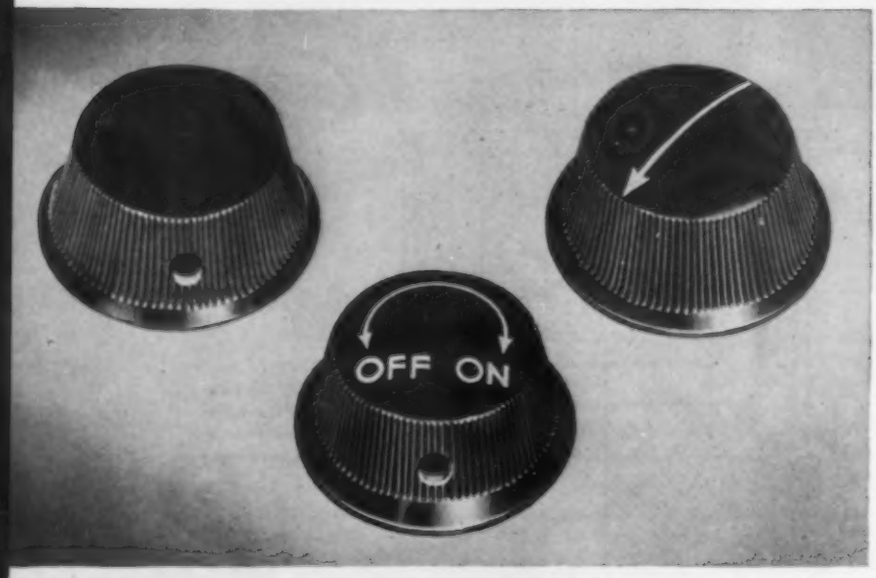
KURZ-KASCH FOR STANDARD KNOBS

A functionally clean and logical design, this knob has served radio, electrical and other industries for over a generation. It has been an indicator control on everything from kerosene stoves to mammoth panel-boards and airplane cockpits. It and its many companion radio, instrument and pointer knobs have made Kurz-Kasch the foremost source of standard plastic knobs in America. For full details, send for the newly-revised Catalog 103A.

Good plastics applications pay off—especially when they are designed with an eye on the years ahead. By "good applications", we mean those that improve products quality-wise or cost-wise—or by supplying special characteristics. There's not much future for plastics used otherwise, for you or your moulder.

For example, we built the first mould for these control knobs 25 years ago. They proved immediately popular, and have continued throughout the years to be a top-selling standard item—so much so that three additional moulds were quickly built to satisfy demand. We've produced million after million of them *from these four original moulds.*

Whether it's a stock or custom job up for consideration, we pride ourselves at Kurz-Kasch on correct plastics applications designed and engineered *to get the most out of initial mould costs.* We maintain that it is the long-running job proving the foresight and capabilities of the established custom moulder that really expresses the plastics industry's bid for the future.



Kurz-Kasch

FOR OVER 31 YEARS PLANNERS AND MOULDERS IN PLASTICS

Kurz-Kasch, Inc. • 1415 South Broadway • Dayton 1, Ohio

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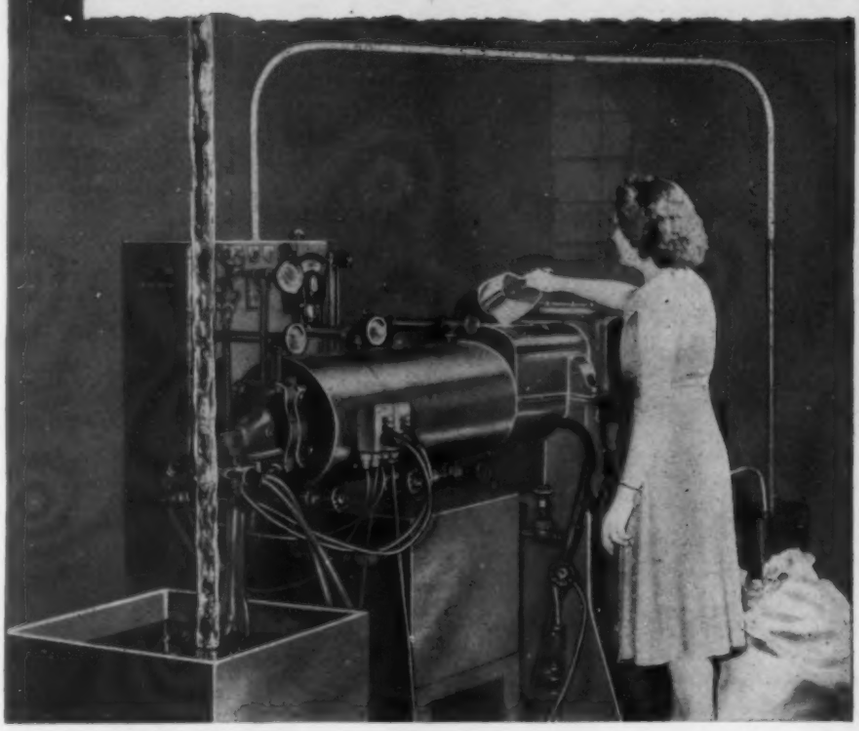
Show windows for the *World's Fastest Selling* MARBLES



Continuous production of thin-wall tubing from a NRM extruder in the Vitro-Agate Plant, Parkersburg, West Va. Requiring a minimum of labor, production is fast, practical and economical.

● Everyone likes to see what they are buying. Youngsters buying marbles are no exception.

In deciding to use transparent plastic containers for their products, Vitro-Agate Company, Parkersburg, W. Va., needed a thin wall material in tubular form, in big volume quickly, to meet their requirements of as many as 60,000 bags a day.

As the world's largest producers of marbles, Vitro-Agate products are shipped around the world. Because of this and the many "handlings" the marbles receive, the package, an extruded polyethylene tube, .002 wall thickness, had to be strong, flexible and durable.

A single 2½" NRM extruder is meeting daily production needs. Vitro-Agate will tell you the extrusion is held to close tolerance and uniform appearance . . . there's no wasted material because the bag sections are cut and flame-sealed in a dual automatic operation. This successful use of NRM Extrusion Equipment should suggest to many, many other producers of a wide variety of products, a means to better packaging at lowered costs.

For equipment specifications to meet *your* needs, write the leading manufacturer of plastics extrusion equipment.

NATIONAL RUBBER MACHINERY CO.

General Offices: AKRON 8, OHIO

Plastics MACHINERY DIVISION

Export Distributors: OMNI Products Corporation, 460 Fourth Ave., New York 16, N. Y.

BY THE "Glow" YOU WILL KNOW THEM

Without the bumps and bruises that usually go with groping around in dark rooms, furniture or other objects that glow are quickly identified, permitting safe movement without bright lights. Table top made of cemented plastic squares (Homalite Co.) pigmented with two Horse Head* Luminescent Pigments.

Practically Anything that's Made of Plastic—or Contains Plastic—Can Be Made "Luminous"

A "LUMINOUS" article—an end table, for example—stands out like a lighthouse to guide you around it—safely. No more stumbling, no more bumping into furniture or other objects, because by the "glow" you will recognize each obstacle in the dark. Other useful applications for "luminous" plastics include lamps and lampshades, clocks, flashlights, switch plates, door push plates, safety signs, door and cabinet hardware—in fact almost any object that will add to the safety or convenience of moving around in darkness. We will be glad to discuss with you these applications—or any others you have in mind.

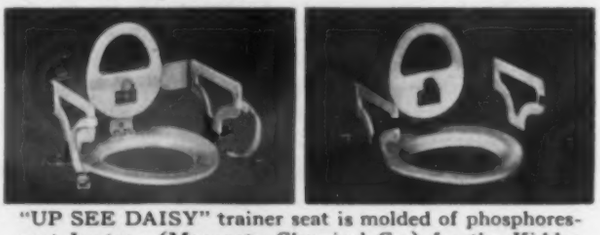
The New Jersey Zinc Company does not make plastics—we supply Horse Head* Luminescent Pigments to plastic manufacturers who produce luminescent molding granules or powders, cast or calendered films, laminating or tubing materials. Their names on request.

*Reg. U.S. Pat. Off.

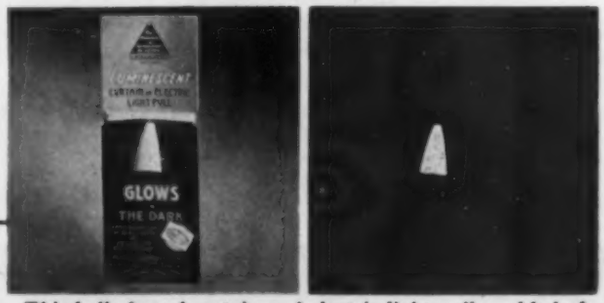
HORSE HEAD PRODUCTS
New Jersey Zinc

THE NEW JERSEY ZINC CO.
160 FRONT STREET • NEW YORK 7, N. Y.

A "Luminous" plastic sheet behind the design in this portable bed lamp is excited by the bulb in the lamp and continues to glow in the dark. Lamp made by The Willor Manufacturing Co.



"UP SEE DAISY" trainer seat is molded of phosphorescent Lustron (Monsanto Chemical Co.) for the Kiddee Training Seat Co.



This bell-shaped curtain and electric light pull, molded of luminescent PAULITE (McCallum, Devitt & Ford), is larger than most "luminous" type pulls.

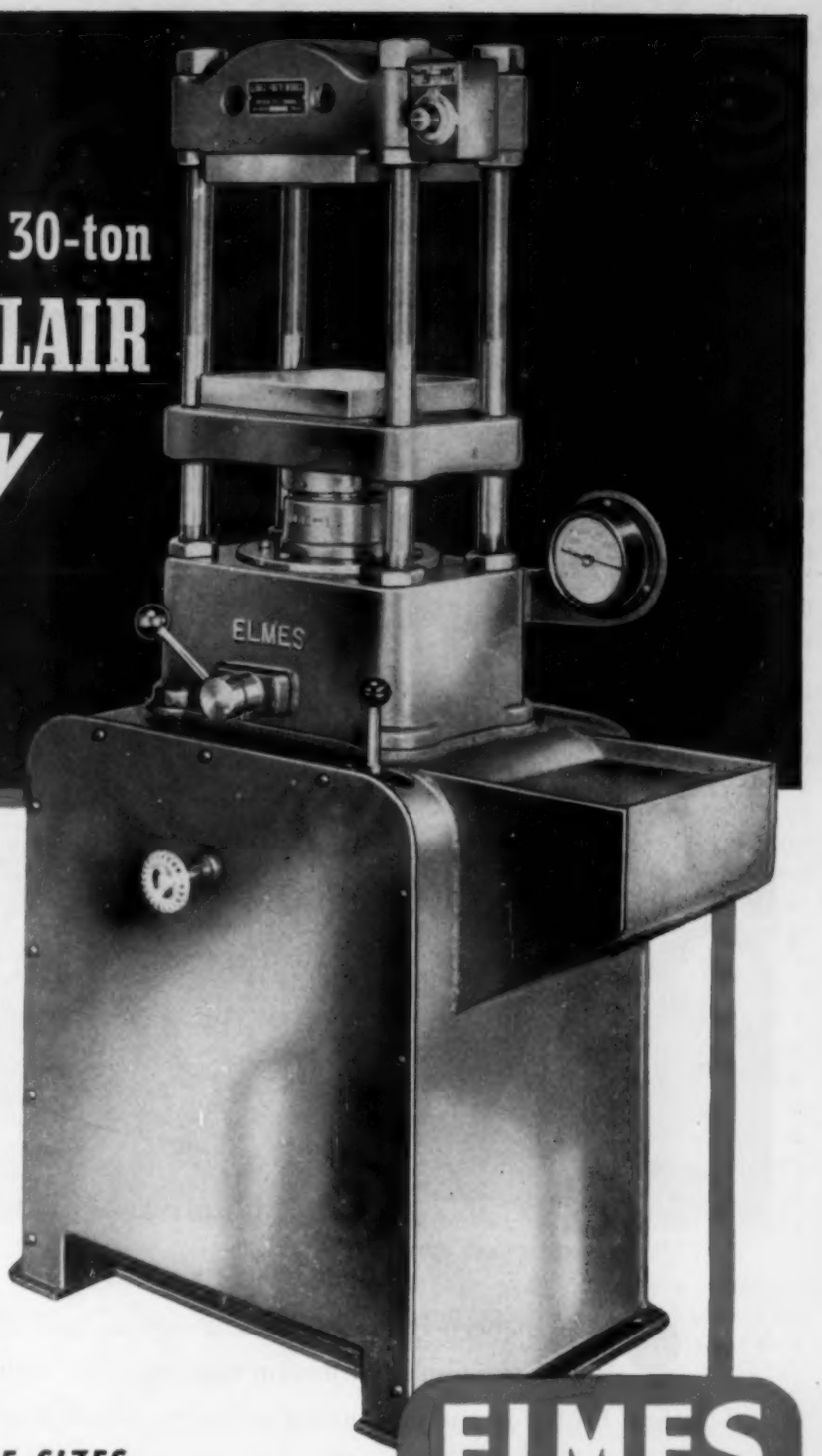
It's Horse Head* Luminescent Pigments *that MAKE these Plastics "Glow"*

This Fast Full Power-Operated 30-ton ELMES HYDROLAIR

(Patents Applied For)

Costs only $900.00

PROMPT SHIPMENTS



WORLD'S MOST ECONOMICAL HYDRAULIC PRESSES TO BUY, TO INSTALL...*to use!*

Pump-less, motor-less Elmes Hydrolairs take their power *entirely* from the shop air line. No worry about foundations or floor loads. No high-pressure piping. Placed anywhere. Just connect them and they're *ready to go to work.*

These fast, accurate, quiet hydraulic presses are the Elmes answer to *quality* output at *low* cost—molding plastics and rubber, laminating, assembly, applying pressure for many purposes.

Simple and sturdy, they're as *good* as they are *good-looking.* Anyone can operate a Hydrolair. Air requirements? *Negligible!* Bulletin 5200 tells the whole interesting story. Ask us for it.

TWO TYPES—THREE SIZES

Hydrolairs are built in 20-, 30-, and 50-ton sizes, and in bench and floor models. **20-TON PRESSES** (2-column design) have 8" x 8" platen, and opening adjustable to 16". *Bench-type:* price, $680.00; weight, 740 lbs. *Floor-type:* price, $840.00; weight, 925 lbs. **30-TON PRESSES** (4-column, illustrated) have 10" x 10" platen, and opening adjustable to 13". *Bench-type:* price, $770.00; weight, 980 lbs. *Floor-type:* price, $900.00; weight, 1325 lbs. **50-TON PRESS** (4-column, floor-type) has 18" x 18" platen, and fixed 14" opening. Price: $1800.00; weight, 3000 lbs. Push-button control also available on 50-ton press. All prices are f.o.b. Chicago. Hot plates and other accessories, extra.

ELMES

Since 1851

HYDRAULIC EQUIPMENT

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES • 225 N. Morgan St., Chicago 7, Ill.

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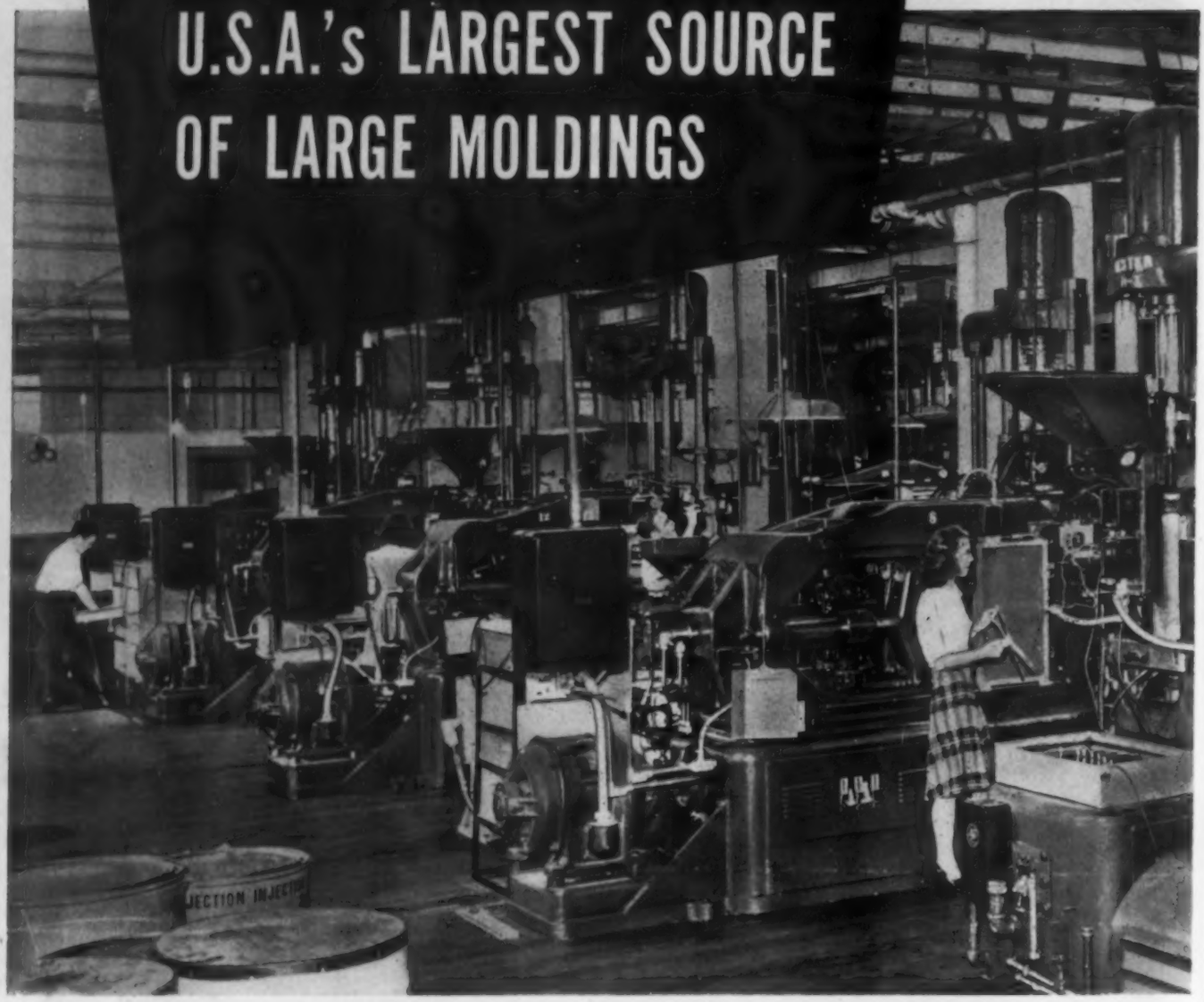

The modern Prolon Plastics plant pictured above has America's largest capacity for heavy section injection moldings. No molder has had more experience than Prolon in the production of heavy pieces. Specialized facilities and specialized knowledge make Prolon Plastics your best bet when you have an exacting plastics problem involving large *or* small pieces . . . by injection *or* compression. Prolon is equipped to help you solve the problem in *all* its phases.

FOR BETTER QUALITY, BETTER SERVICE, WRITE TO

PROLON PLASTICS

A DIVISION OF

PRO-PHY-LAC-TIC BRUSH CO., FLORENCE, MASS.

RESEARCH ★ DEVELOPMENT
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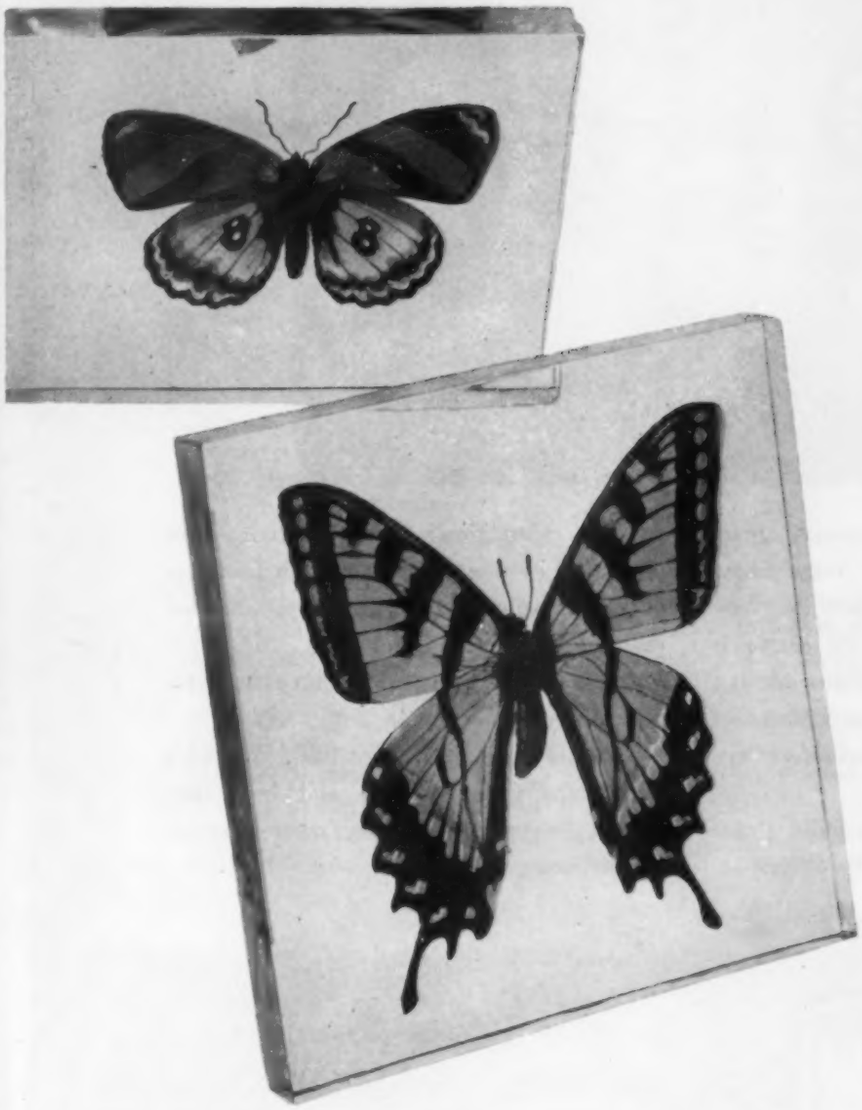
AND INJECTION MOLDING

UNUSUAL
plastic finishing
PROBLEM SOLVED BY LEA



Mr. C. M. Hardiman of Cleveland, Ohio, molds tropical moths and butterflies in a clear colorless plastic of his own composition for use by high schools and colleges and as custom mounts for collectors. LEA Technical men helped him work out a finishing procedure.

Mr. Hardiman says: "Prior to buffing, I work the rough pieces to a square and plane surface, with a coarse sanding belt operation, following with a 180 grit sanding belt. This procedure had been recommended to me by several specialists in plastic finishing, with the recommendation of various buffing compounds to use after sanding. None of them gave a finish that anyone could call satisfactory. My trouble finally reached LEA and they advised using Grade R LEA Compound lubricated with #884 Learok, in the first buffing operation, to remove the 180 grit scratches. This to be followed with #884 Learok to give a lustre finish. This procedure gives me a much better finish, and it is also a much faster operation."

Perhaps you too have a finishing problem on some molded part. Our engineers will be glad to assist you in its solution. LEA Methods and LEA Compounds may improve the quality and cut the production time on your job.

THE LEA MANUFACTURING CO.

Burring, Buffing and Polishing... Manufacturers and Specialists in the Development of Production Methods and Compositions

16 CHERRY AVENUE WATERBURY 86, CONNECTICUT

PUTTING TIME INTO PLASTICS

Clean, precise molding that enhances smart styling is a feature inherent in the Shaw technique. The plastic case for the new Pennwood electric clock shown above is an example. Here up-to-the-minute design is smoothly executed in plastics, a blend of form and material with persuasive eye appeal.

Shaw used an angle press to mold a case that simplifies assembly and provides insulation protection. Two materials were employed — phenolic compounds for cases of black, walnut and mahogany; urea for cases of ivory, peach and blue.

Time in plastics is something that Shaw has plenty of.

Molders since 1892, Shaw has a thorough understanding of plastics and how they should be molded for the most effective and economical results.

SHAW

SHAW INSULATOR COMPANY

MOLDERS QUALITY MARK ON MOLDED PLASTICS SINCE 1892

160 COIT STREET IRVINGTON 11, N. J.

PLASTICS LITERATURE AVAILABLE

Shaw engineers have prepared a variety of literature, study of which might help you to a decision. Simply write a note about what phases of plastics especially interest you.

Or, you may prefer at once to call in a Shaw engineer, and present your problems for his study. This company's fifty-five years of plastics experience gives him a rich background from which you can draw.

Between the resources of Shaw and the Plax Corporation, Hartford 5, Conn., you can obtain assistance in almost all plastics methods and materials.

FOR MEN ONLY — PLAX POLYETHYLENE

A new assortment of Seaforth toiletries, retailing at $1.25 per bottle, comes in Polyethylene containers.

Now a fumble that causes a tumble won't mean a crash. For besides being light, Plax Polyethylene blownware is unbreakable. Just as importantly, it makes an attractive package, and one that is pleasant to the touch.

Polyethylene is desirable in other ways, too. Non-toxic, tasteless, odorless and chemically-resistant, it is a neutral packaging material in which a product can remain at ease — efficiently protected, effectively presented. And not to be forgotten is the fact that there is as much saving as 75 per cent in weight and 20 per cent in cubage.

Plax Polyethylene blownware may be the answer to your container problem. If you want color, a number of them are at your command. And, it's not really for men only — any product that can use a light but tough yet attractive container is a natural for Plax Polyethylene blownware.

WRITE FOR THIS POLYSTYRENE DATA

How to Machine Plax Polystyrene Products.
How to Use Coolants with Plax Polystyrene Products.
How to Cement Plax Polystyrene Products.
How to Polish Plax Polystyrene Products.
Notes on Design and Assembly of Plax Polystyrene Products.
Die-cut Parts from Plax Polystyrene.
How to Form Plax Polystyrene Rod.

AND THIS PRODUCT INFORMATION

Data Sheets on Plax Cellulose Acetate, Cellulose Acetate Butyrate, Methacrylate, Polyethylene, Polystyrene and Ethyl Cellulose Products.
Article on Plax's Blown Products.
New special plastic shapes by Plax.

PLAX
FOR PLASTICS
NOT SUBSTITUTES···IMPROVEMENTS

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He gives bearings a rub-down to put curves in the right places

. . . for faster operation, greater accuracy, maximum load capacity

IN the final manufacturing process, Timken T-type thrust bearings are assembled and processed so that the surfaces of the ribs, rollers and races are generated as a unit. The bearing thus becomes a "Generated Unit Assembly".

This extra process produces a smoothly-curved area of contact between the end of each roller and the cone rib against which it operates, so that the convex shape of the roll end and the concave surface of the cone ribs are identical in contour.

We developed this process years ago for thrust bearings which must operate under extreme loads with high roll and pressures against the cone ribs end since have adapted it to other Timken bearings, including those used for precision machine tools, steel mill and railroad equipment and other applications.

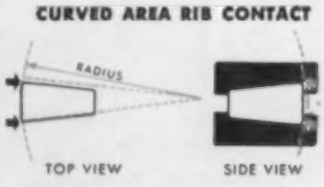
Today "Generated Unit Assembly" reduces friction and wear to the vanishing point; increases load capacity; assures positive roll alignment; eliminates the need of breaking-in or final adjustment on the job; and lengthens bearing life. It is one of the many reasons why it pays to have Timken bearings in every machine you manufacture or buy.

REMEMBER, Timken bearings are produced by the only bearing manufacturer in the country making its own steel and Timken is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels. The Timken Roller Bearing Company, Canton 6, Ohio.

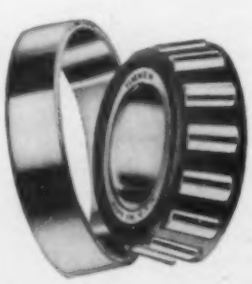
GENERATED UNIT ASSEMBLY

Extra manufacturing process makes Timken heavy duty thrust bearing a "Generated Unit Assembly".

CURVED AREA RIB CONTACT



Curved area of roll end (at arrows) fits perfectly the curve of upper and lower ribs of this thrust bearing.



TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◐ AND THRUST →◐← LOADS OR ANY COMBINATION ✳

NIXON Makes 3 Cellulosics to Meet Your Requirements

NIXON C/N (Cellulose Nitrate). Available in rods, tubes, and extruded shapes. Also furnished in sheets which can be easily fabricated and formed. Although it is a tough material, Nixon C/N can be easily printed, stamped, molded, extruded, drilled, tapped, turned, cemented, polished, and shrunk in place. Nixon C/N is a tough, durable plastic which is practical for many purposes. Offered in a practically unlimited color range including variegated color effects.

NIXON C/A (Cellulose Acetate). Available in rods, tubes, extruded shapes, and sheeting. We also furnish Nixon C/A (Cellulose Acetate) molding powders in Clear Transparent and every color of the spectrum, in varying degrees of transparency or translucency, also colored opaques and black. Nixon C/A is a plastic with high impact strength which is easily fabricated.

NIXON E/C (Ethyl Cellulose). Available in molding powders suitable for extrusion and injection molding. Also furnished in rods, tubes, extruded shapes, and sheeting. Excellent resistance to strong alkalis. Unlimited color range. Transparents, translucents and opaques in any desired color. High dielectric strength.

Nixon

C/N CELLULOSE NITRATE

C/A CELLULOSE ACETATE

E/C ETHYL CELLULOSE

Plastics

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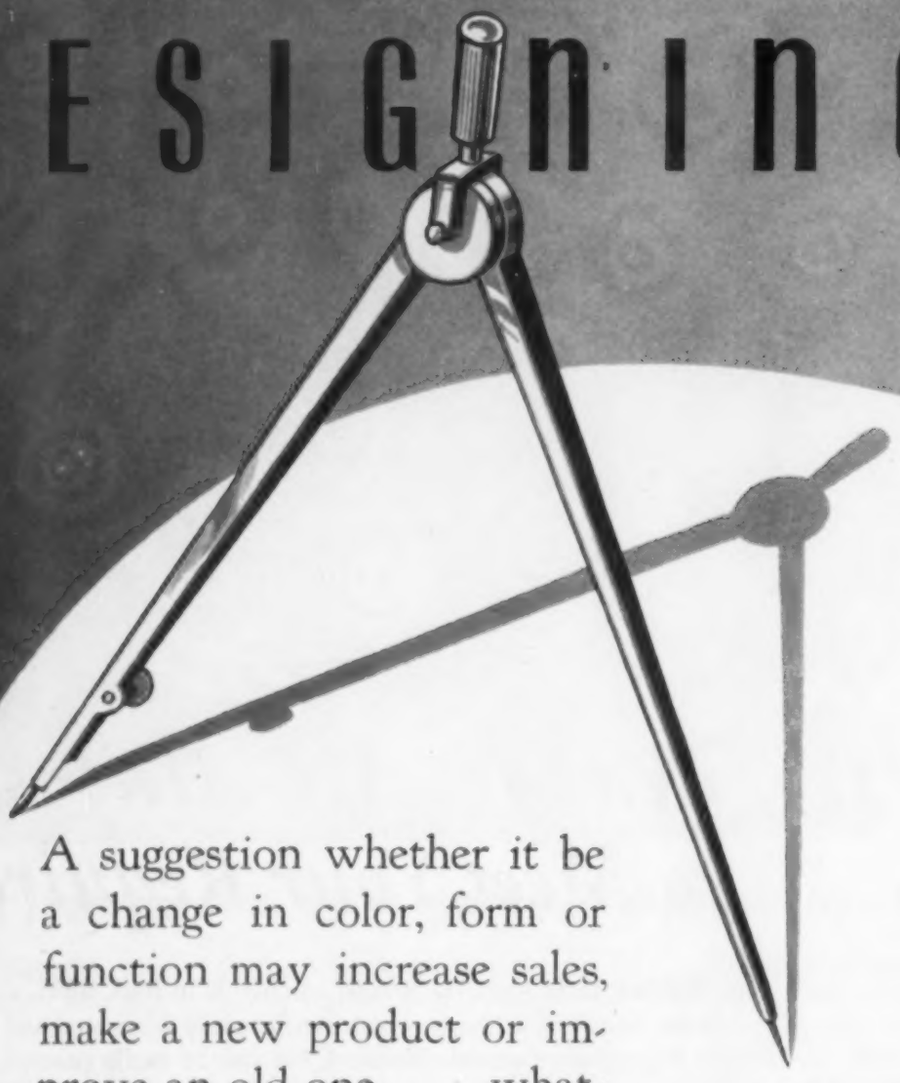
DESIGNING



A suggestion whether it be a change in color, form or function may increase sales, make a new product or improve an old one . . . whatever your problem, our design department is at your service.

INJECTION MOLDING
MINCOR
"YOUR PLASTICS DEPARTMENT"

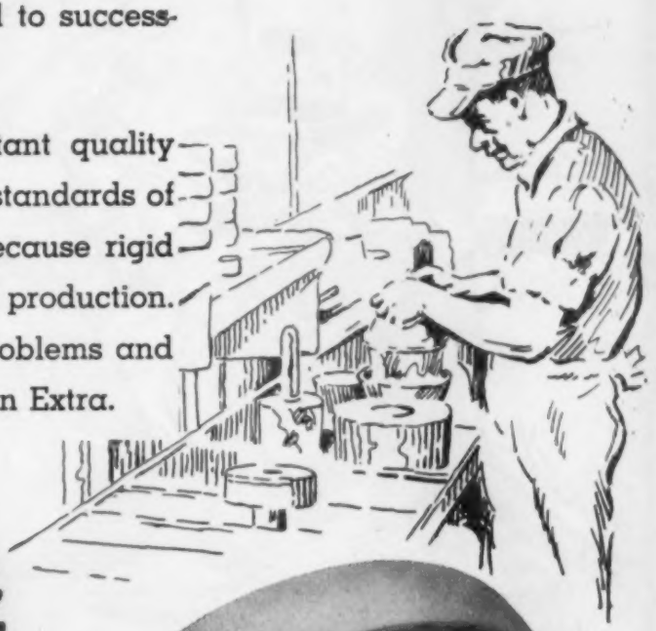
MINNESOTA PLASTICS CORP.

366 WACOUTA STREET ST. PAUL 1, MINNESOTA

Successful Lamination Starts With Fabric Uniformity

Even penetration of resins, so essential to successful lamination, starts with fabric uniformity.

Mt. Vernon Extra fabrics have this important quality because they are spun and woven to rigid standards of tolerance from top grades of cotton and because rigid laboratory controls guide every step in their production. For fabrics that will minimize processing problems and aid successful lamination, specify Mt. Vernon Extra.



uniformity makes the big difference

TURNER HALSEY
COMPANY
Selling Agents
40 WORTH ST. • NEW YORK

Mt. Vernon-Woodberry Mills

Branch Offices: CHICAGO • ATLANTA • BALTIMORE • BOSTON • LOS ANGELES • AKRON

THERE'S "SHODDY" IN ALL LINES...

Yes, even in plastics. Want to know how to get away from it?

Let the molder's name behind your product be your protection. It will be—provided you choose a molder (like Boonton) that's got a good reputation for molding parts that work, from raw plastic materials that are right for your specific product!

It *always* pays off to LOOK AT THE NAME BEHIND THE CONTRACT.

Molded at Boonton Means Good Plastic Molding

BMCO

SPI SOCIETY OF THE PLASTICS INDUSTRY

FOR OVER 25 YEARS
CUSTOM ENGINEERS
OF MOLDED PLASTICS

BOONTON MOLDING COMPANY

MOLDERS OF MOST PLASTICS BY MOST METHODS

122 EAST 42nd ST., NEW YORK 17 · SUITE 1716-M MURRAY HILL 6-8540

FACTORY—BOONTON, New Jersey

Waterbury Companies

NOW HAVE FIVE DEFIANCE PREFORM PRESSES

Waterbury Companies, Waterbury, Conn.—one of the oldest button manufacturers in America—started with ONE Defiance Plastic Preform Press. Results were so satisfactory—now they have FIVE—four No. 20 presses and one No. 45.

Shown here is their Defiance Model 45. This machine *reduces preform cost* by producing big preforms (rectangular tablet 3½" x 8" max. area, or round tablet 6" max. diam.); *increases output per operator and per machine; reduces molding labor* with less handling; and *improves molded product* with closer control of weight and uniformity.

Other plants everywhere are *repeating* their orders for Defiance Preform Presses! Write for bulletins. Defiance Machine Works, Inc., Defiance, Ohio.

97 YEARS OF PRECISION MANUFACTURING

DEFIANCE

PLASTIC PREFORM PRESSES

"That makes sense—

using Fiberglas-Reinforced Plastics"*

T-36 Fiberglas mat is *low in cost* and is used advantageously with *high-pressure laminating equipment* . . . This may be the answer to some of your problems. If you are designing, manufacturing or need products which require high impact strength, low moisture absorption, dimensional stability, high temperature resistance, corrosion resistance, good electrical qualities—find out about Fiberglas T-36 mat as a reinforcement for high-pressure resins . . . This product is also well adapted to new, high-speed, low-pressure molding processes.

WRITE FOR SAMPLE OF T-36 MAT AND NEW BOOKLET which describes the various forms of Fiberglas reinforcing materials and illustrates the new quantity production methods. Write: Owens-Corning Fiberglas Corporation, Dept. 876, Toledo 1, Ohio. Branches in principal cities.

In Canada: Fiberglas Canada Ltd., Toronto 1, Ontario.

OWENS-CORNING

FIBERGLAS

REG. U.S. PAT. OFF.

FIBERS • MATS • CLOTHS

*FIBERGLAS is the trade name (Reg. U. S. Pat. Off.) of a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.

THE CASE *of the* VIBRATOR *held no mystery for us*

—and the masseur or chiropodist who buys the distinctive new Foredom Electric percussion vibrator will immediately appreciate the pleasant touch, lasting beauty and ruggedness of its shining black Creative handle. Whether your need is a simple knob, bushing, or an elaborate housing, have Creative show you how to use plastics to your best advantage.

Plastics Specification Quiz: If it's not convenient for you to send blueprints or samples, write for our "Plastics Specification Quiz". Two minutes with this Quiz will enable you to tell us which of your products may be improved by the use of plastics.

Creative

PLASTICS CORP.

960 KENT AVENUE • BROOKLYN 5, N.Y.

Common Sense Assembly Engineering

reflects an edge on competition in this case . . .

Nine P-K Type "U" Drive Screws are used in the assembly of this cellulose acetate vanity case, to attach the brass hinge, the plastic knobs, and the metal locking clip on the compartment cover.

Plastic Enterprises, Inc., the manufacturers of this attractive plastic vanity case, needed the simplest, speediest fastener available because costs had to be trimmed to permit pricing to meet close competition. But, in addition, the fastener had to stand up under the constant, often careless, opening and closing a vanity case must endure.

It didn't take long to find that it was only common sense to use P-K Type "U" Drive Screws. They provide the lasting, secure fastening needed — yet they are easily driven into untapped holes. There are no unnecessary operations to slow down production and run up costs.

If you need an "edge" on competition, why not make similar savings in assembly time and labor by eliminating needless mold-slowing inserts or troublesome tapping for machine screws. In many cases P-K Screws permit improvements in product design.

If you use fasteners in your product, call in a P-K Assembly Engineer. He can show you that in 7 out of 10 jobs, P-K Self-tapping Screws will save up to 50% in assembly work-hours. Or, mail assembly details for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Sold Only Through Accredited Distributors

P-K

PARKER-KALON SELF-TAPPING SCREWS

A FASTENING FOR EVERY METAL AND PLASTIC ASSEMBLY

3 WAYS TO SAVE $

WITH

VAN DORN

plastics injection presses

A Van Dorn 1 oz. Plastics Injection Press offers the ideal solution for producing moderate quantities of plastic parts at a profit. With a Van Dorn, you tie up less working capital—molds are more economical—set-up time is less! For flexibility and productive capacity that meets today's requirements—investigate Van Dorn.

write for Free Bulletin

which illustrates and describes the Model H-200 Van Dorn Plastics Injection Press and its many applications.

THE VAN DORN IRON WORKS CO.

2687 EAST 79TH STREET • CLEVELAND 4, OHIO

THE PLASTICATOR HAS TRIPLE MIXING ABILITY

The 6" Gordon Plasticator with die head open, showing strainer plate.

for blending plastics

Designed specifically for continuous mixing of the various powders or granules that go into numerous thermoplastics, this machine performs three successive operations which assure thorough blending in a single pass.

This triple mixing action combines and works partially preblended mixtures of thermoplastic resins, fillers, plasticizers and coloring matter, and extrudes the stock in a continuous strip.

The screw which conveys the stock through a cylinder, jacketed for temperature control, has a section of forcing thread at the feed end, followed by a plasticating thread. In this intermediate area, where the screw is smaller in diameter, the forward motion of the stock is retarded and the mixture allowed to work in the space between the top of the thread and the cylinder wall. Beyond this point the thread diameter is again increased to force the stock between a stationary plasticating head and a revolving cone. This results in an intensive milling action on the material as it progresses toward the die head. Just before extrusion through the die, a screened strainer plate provides a means of breaking up any minute particles which might remain.

We shall be glad to supply complete information on this continuous production unit or on any of the other plastics processing machines listed on this page. FB-345

FARREL-BIRMINGHAM COMPANY, Inc.
ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Pittsburgh, Chicago, Los Angeles, Tulsa, Houston

F-B PLASTICS MACHINERY

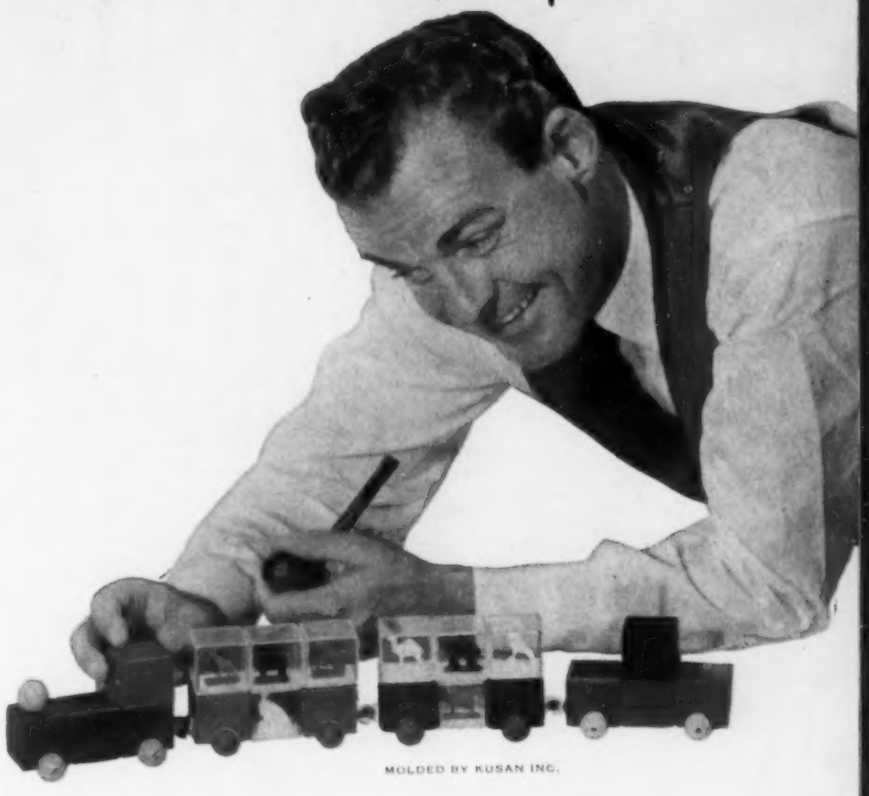
- Banbury Internal Mixers
- Roll Mills
- Converting, Mixing and Sheeting Rolls
- Calenders
- Plasticators
- Extruding Machines
- Hydraulic Presses
- Hydraulic Accumulators
- Sheet Cutters or Planers

Farrel-Birmingham

STYRON the right plastic

right

in the newest toys!



MOLDED BY KUSAN INC.

right

in the whole whirl of toyland!

MOLDED BY MICHIGAN PLASTIC PRODUCTS COMPANY FOR TOY FOUNDERS INC.

MOLDED BY SAUNDERS TOOL AND DIE CO.

Development *of polystyrene is one of Dow's greatest plastics achievements.*

Production *capacity of Styron (Dow Polystyrene) has expanded 10 times over prewar.*

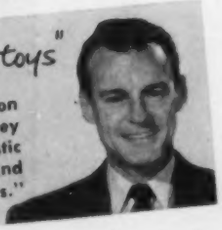
Engineering *assistance on Styron applications is a regular service of Dow and skilled molders.*

NO WONDER Dad's playful! He's bought Junior some brand new toys made of Styron, that sparkling Dow Polystyrene Plastic. Come Christmas, you'll see Styron highlighting toy departments everywhere. Wise manufacturers . . . smart merchandisers . . . are ready now. They know colorful Styron gives playthings that sales-making *modern* look—a smooth, warm, new feel—a lightness that everyone likes. They know it's good business to feature this exciting material in products best suited to its special combination of beauty and serviceability. And did *you* know that—with all these advantages—Styron's price is remarkably low? Better get the whole story—call your nearest Dow office today.

Plastics Division • THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN
New York • Boston • Philadelphia • Washington • Cleveland • Detroit
Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Ontario

"Why I prefer plastics in my children's toys"

"I'll have to admit it—these colorful new toys made of Styron give me nearly as big a kick as they do the kids," says Wesley Burton of Highland Park, Mich. "And I know this fine plastic is smooth and clean—light in weight, too—just the kind of material I like to see in toys for my own youngsters."



DOW plastics

Plumbing fixtures

Washing machine agitators

Automobile instrument panels

IF IT'S A BIG PLASTIC PART... GENERAL AMERICAN CAN BUILD IT BETTER!

Refrigerator door trim

YOUR PRODUCT ?

An impressive battery of the world's largest injection molding presses

General American has the engineering skill, the creative imagination, and the equipment to manufacture large and complex plastic parts.

Waiting to serve you at General American are batteries of large volume injection molding presses, including the 32-oz. type, and compression presses ranging up to 500-ton, 1000-ton and 2000-ton capacities. That means *volume* — a smooth flow of plastic parts to your production lines.

Submit your plastics problems to us for design, engineering and prompt quotations.

PLASTICS DIVISION

GENERAL AMERICAN TRANSPORTATION

CORPORATION

135 South La Salle Street • Chicago 90, Illinois

We would like to help you find new and profitable uses for

AMERICAN ANODE *latices and mixes*

★

MANY seemingly impossible things have been done lately with American Anode latices and mixes. For example, high-altitude oxygen masks with intricate systems of ducts and metal inserts; meteorological balloons that are 5 feet in diameter uninflated, 28 feet inflated, that rise more than 20 miles into the air; amazingly complicated surgical catheters with 3 or more tubes, yet made in one piece.

American Anode latices and mixes are also used as coatings and impregnants for textiles and paper, and as adhesives in a wide variety of applications.

Most of these uses are the direct result of the work done by American Anode development men in our completely equipped development and research laboratory—men with the experience needed to permit us to offer you a *complete* research, design, engineering and production consultant service.

Don't assume that a product can't be made—or a problem solved—with latex until you've consulted with American Anode development men.

Latices and compounded mixes of GEON, HYCAR, Saran, neoprene, crude rubber and GR-S are available. For more information about these modern materials—*and proper methods of using them*—please write Department AF-5, American Anode Inc., 60 Cherry St., Akron, Ohio.

AMERICAN ANODE

INCORPORATED

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS

TRAINING

in step with

INDUSTRIAL TRENDS

Plastics Institute training is predicated upon two basic principles:

A. Thorough study of accepted practices and materials.

B. Evaluation of current problems, new materials and new techniques.

For example, here are

THREE TYPICAL CASTING ASSIGNMENTS

Casting of Phenolic Resins Industrial and decorative applications of cast plastics are prominently featured in student projects. Each student is given opportunity to prepare his own molds and castings.

Slush Casting of Thermoplastic Granules Various techniques of slush casting thermoplastic granules are taught. Attractive, light colored hollow-walled objects can be prepared in a relatively short time.

Imbedding of Specimens in Transparent Plastics The imbedding of articles in transparent plastics has captured the interest of many students. Preservation of botanical specimens offers a field of activity which benefits from this unusual casting procedure.

In addition to casting, other phases of plastics thoroughly covered at Plastics Institute include: Mold design, high-frequency pre-heating, fabrication and lamination. Testing methods and molding practices are taught on equipment of the type used in the industry.

Your inquiries regarding both the Home Study Training and Resident Technology courses are welcomed.

Resident School and Home Study Courses APPROVED FOR VETERANS

Plastics
INDUSTRIES TECHNICAL INSTITUTE

Francis A. Gudger, President John Delmonte, Technical Director

WRITE DEPT. MP7-10

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VETERANS as well as CIVILIANS now training with Plastics Institute, upon graduation, are qualified and worthy of your consideration for employment in the various branches of the plastics industry. Write to the nearest branch of Plastics Institute stating your requirements. We will endeavor to select a graduate best qualified to meet your needs.

EXPERIENCE KNOWS THE SHORT-CUTS

IN the north woods, the guide is followed because of his experience, his knowledge of the existing short-cuts, his ability to "get there" with least expenditure of time and energy. Experience and knowledge and successful accomplishments give to the engineers and technicians of Chemical Plants Division a status as guides in the world of the process industries. Out of their experience, they know the short-cuts to profitable new process planning and plant construction.

The Chemical Plants Division is a complete, self-contained engineering and construction organization. Its exceptionally capable services conform in every respect with the highest technical and professional standards. It designs, builds and places into operation entire process plants.

CHEMICAL PLANTS DIVISION
of Blaw-Knox Construction Company
321 Penn Avenue, Pittsburgh 22, Pa.

CHEMICAL PLANTS DIVISION

OF BLAW-KNOX CONSTRUCTION COMPANY

18 Molds . . . Machined

● Total turning time is seven hours—on a set of 18 inserts (six of each) for a multiple-cavity gasket mold.

That's the Monarch-Keller production . . . contrasted with 60 hours, the time it took by more conventional machining methods. If you're looking for similar savings, it will pay you to investigate contour turning the Monarch way.

The Monarch-Keller was the *original* tracer-controlled lathe; over 1,000 are now in use. These Keller controls, adaptable to any Monarch Lathe above the 12″ size, permit fast, accurate, *economical* turning, facing and boring of irregular contours from a thin metal master template. When not in use, the controls can be quickly disconnected to permit regular turning work. For complete details, ask for our new bulletin 2401, on the improved Monarch-Keller Form Turning Machines.

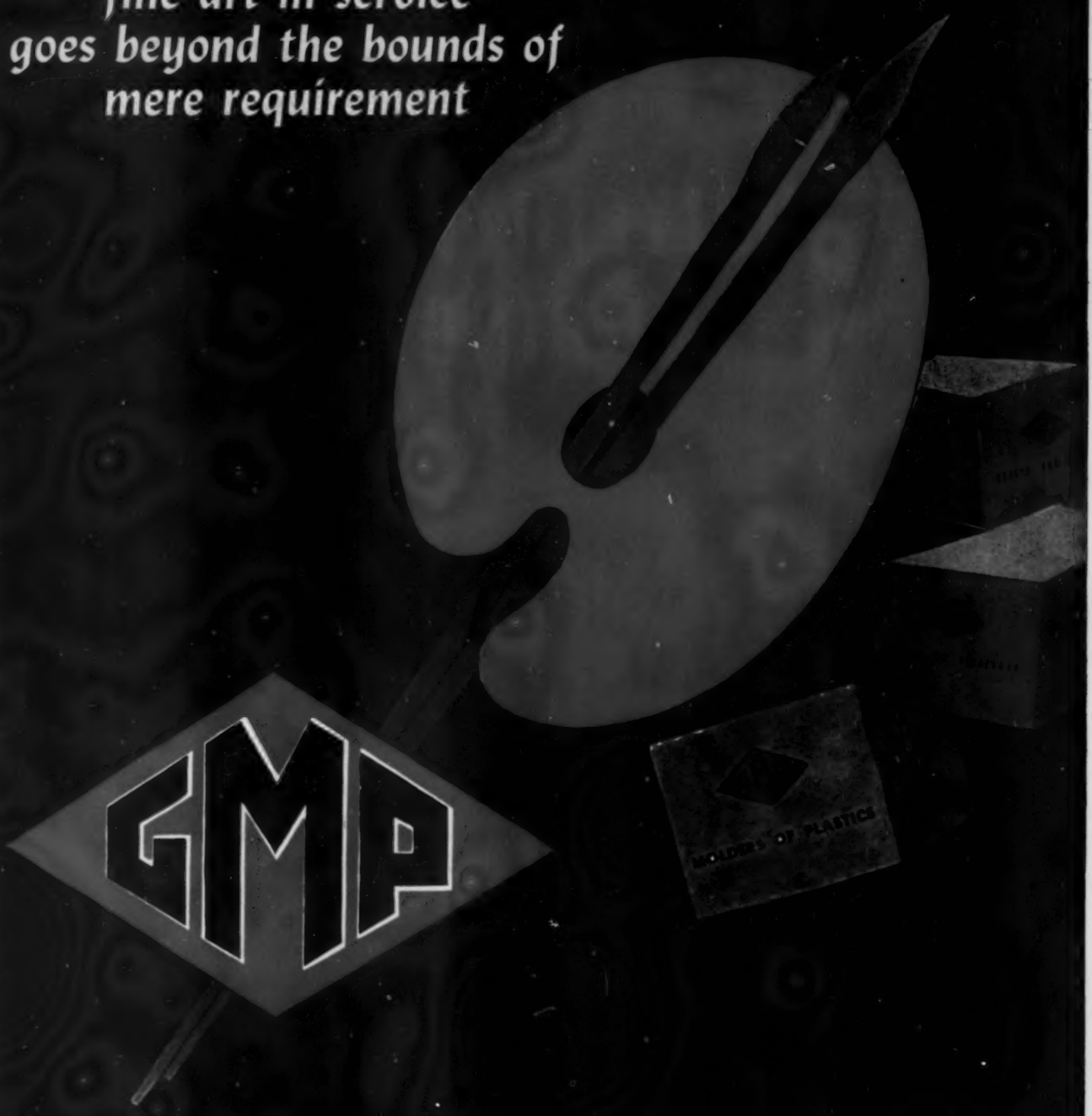
ACCURACY - ECONOMY - LONG LIFE

Monarch
TURNING MACHINES

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

FOR A GOOD TURN *FASTER* — TURN TO MONARCH

fine art in service goes beyond the bounds of mere requirement



Molders of Plastics

MEMBER SOCIETY OF THE PLASTICS INDUSTRY SPI

GENERAL MOLDED PRODUCTS · INC

OFFICE AND PLANT · DES PLAINES · ILLINOIS · *Suburb of Chicago*

A NEW CARTER PRODUCT

A Heavy-Walled, Corrosion-Proof Tubing for Water and Drain Pipes

This Carter extrusion product is unusually sturdy and at the same time flexible enough for easy handling. Its exceptional corrosion-resisting properties make it adaptable for use in mines, oil fields and chemical plants for water and drain pipes.

Standard pipe sizes up to 3″ diameter are readily available but Polyethylene tubing can be furnished in diameters up to 3″ in any specified thickness of wall. This high grade precision tubing extruded from Polyethylene has many excellent properties that make it superior to metal pipe for a wide range of applications.

Write for complete details

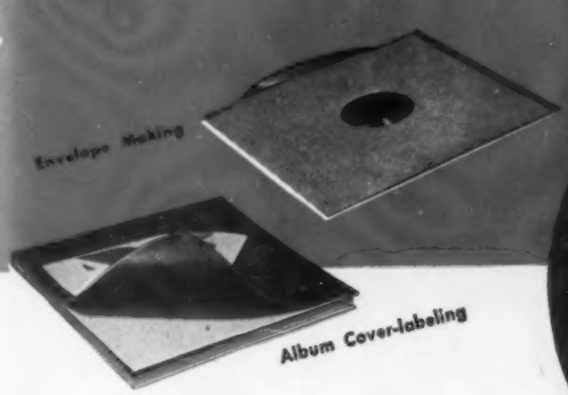
CARTER
PRODUCTS CORPORATION

Manufacturers of Extruded Plastics

10225 Meech Avenue, Cleveland 5, Ohio
Phone: BRoadway 6565

Extruded Plastics

NINE ADHESIVES



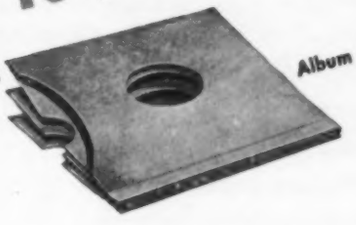
Envelope Making

Album Cover-labeling

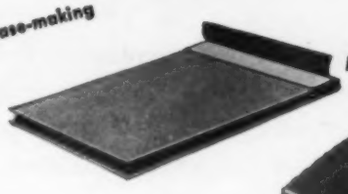
Labeling

to package the record

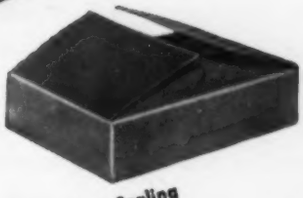
Album Casing-in



Album Case-making



Album Backing



Case Sealing

Labeling and Overcoating

Glued-unit carloading

YES As specialists in developing and applying adhesives made from every available base, we are in the unique position of being able to deliver the exact types of adhesives needed to do any packaging and shipping job — *completely and successfully!*

Address: 270 Madison Avenue, New York 16; 3641 So. Washtenaw Ave., Chicago 32; 735 Battery St., San Francisco 11; and other principal cities. In Canada: Meredith, Simmons & Co., Ltd., Toronto and Montreal. In England: National Adhesives, Ltd., Slough.

National ADHESIVES

EVERY TYPE OF ADHESIVE FOR EVERY INDUSTRIAL USE

We are prepared to work with your organization through all phases of a molded plastics application—from preliminary discussion and research to design development, molding and finished assembly. Our equipment is the most modern type for injection, transfer and compression molding. We are experienced in precision molding to extremely close tolerances, and have facilities for high speed, volume production. One of our specialties is molding plastics in combination with complementary metals. Working closely with engineering departments of plastic users, we have developed new molding techniques and unusual plastics applications. Let us discuss your products and how they may benefit further from plastics. For additional information on our services write for Catalog Folder MP 10.

PM

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PLASTIC MANUFACTURERS

INCORPORATED

STAMFORD, CONNECTICUT

INJECTION, TRANSFER & COMPRESSION MOLDING • COMPLETE ASSEMBLY

REPRESENTATIVES: NEW YORK 1, N. Y. — 19 W. 34th ST. • DETROIT 2, MICH. — 805 NEW CENTER BLDG. • LOS ANGELES, CAL. — 1440 ROBERTSON BLVD. • PITTSFIELD, MASS. — 329 CONNECTICUT AVE. • WARREN, OHIO — 2614 E. MARKET ST.

SOMETIMES the TUBING *Must* BE PLASTIC

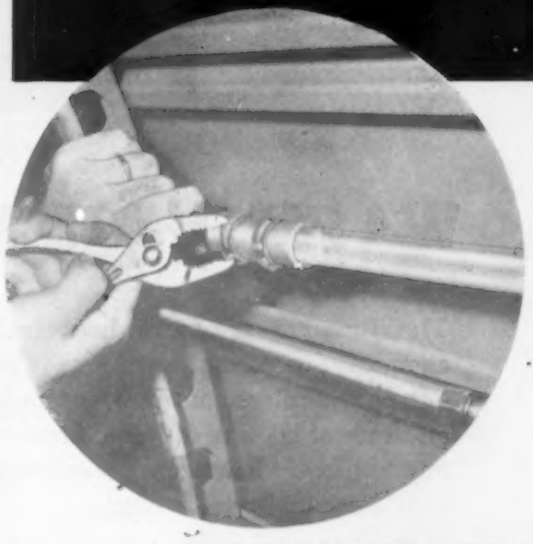
TASTELESS TUBING

A tubing problem existed in the development of Boeing's gigantic Stratocruiser, destined to land in all parts of the globe. Boeing engineers found that the mineral content in drinking water of some countries reacted badly on metal tubing, making the water unpalatable. After extensive research, they found that Tennessee Eastman's Acetate Butyrate material was not affected by any of these minerals. As a result, each Stratocruiser's drinking water system is equipped with this "tasteless tubing" extruded to specifications by MACOID.

★ ★ ★

For many installations, plastic tubing is far superior to metal. Some plastics are not attacked by minerals, acids, or chemicals. Some are flexible; others are rigid. Each use requires careful evaluation of properties to find the right material.

When a special problem in tubing is encountered, MACOID is equipped to select materials, design and mass-produce all kinds of thermoplastic tubing up to 2″ diameter in rigid materials and up to 6″ diameter in flexible vinyls.



Installation of MACOID tubing is easy. As pictured above, lightweight clamps seal the joints. Each Boeing Stratocruiser's drinking water system requires 435 feet of this tubing.

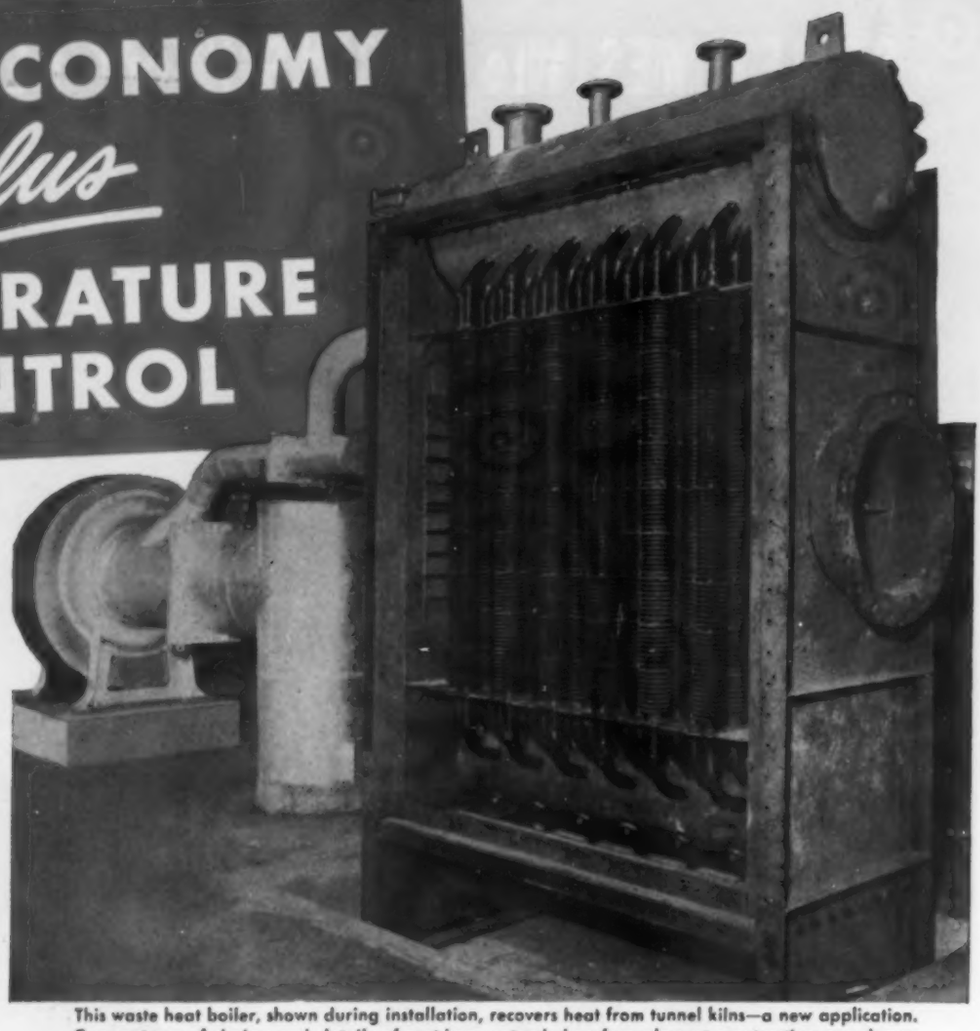
DETROIT MACOID CORPORATION

Originators of Dry Process Plastics Extrusion

12340 CLOVERDALE • DETROIT 4, MICHIGAN

EXTRUSION AND INJECTION MOLDING

FUEL ECONOMY *plus* TEMPERATURE CONTROL



This waste heat boiler, shown during installation, recovers heat from tunnel kilns—a new application. Compactness of design and details of cast-iron, extended surface element construction are shown.

WASTE HEAT BOILERS GIVE BOTH

The function of waste heat boilers in chemical processing operations is two-fold —to provide close control over temperature and rate of cooling of hot, corrosive gases, and to recover heat from these gases which would otherwise be wasted.

Temperature control by other methods has proved generally uneconomical, while heat recovery and re-use to generate steam or heat water means lower fuel cost.

Constructed to resist corrosion, tubes of Foster Wheeler waste heat boilers are protected by a sheath of cast iron. Extended surface elements speed cooling and reduce gas-travel time and distance through the unit.

The complete story of waste heat boiler application in many plants is in Catalog WHB 47-4. Send for a copy to determine whether such possibilities for economy exist in your own plant.

FOSTER WHEELER CORPORATION
165 BROADWAY, NEW YORK 6, NEW YORK

FOSTER WHEELER

The Coronation Diamonds Crown Case (Patent Pending)

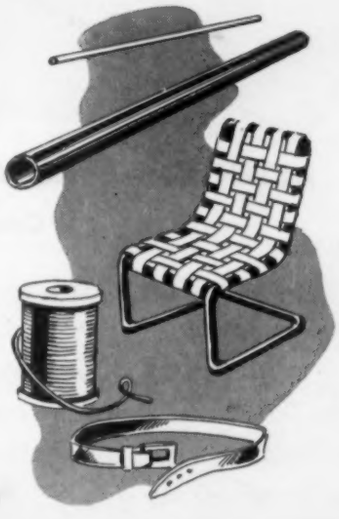
Another Celluplastic Achievement!

AN EXAMPLE OF CELLUPLASTIC SKILL IN INJECTION MOLDING. CELLUPLASTIC IS EQUALLY EXPERT IN EXTRUSION MOLDING.

Product of Celluplastic versatility and ingenuity, this exquisite case has just been designed, engineered and injection-molded for Coronation Diamonds. In producing this case, Celluplastic adds again to its brilliant list of achievements in injection molding. Equally impressive, of course, is the Celluplastic record in the field of extrusion molding.

Celluplastic experience in plastics dates back to 1919. Celluplastic today has at its command the best engineering brains in the industry. And finally, Celluplastic owns one of the world's finest plastics plants.

We invite *you* to consult Celluplastic on injection or extrusion molding. We have machine capacity up to 22 ounces per shot for injection molding. In extrusion molding, we produce special and standard shapes, both flexible and rigid, in all colors and in all thermoplastics. Among our products are rods, tubes, belting, monofilaments, yarns and furniture webbing. Consult Celluplastic *today*.



ALSO—AMERICA'S #1 SOURCE FOR PLASTIC CONTAINERS

Celluplastic Corporation

50 AVENUE L, NEWARK 5, N. J.

PLASTIC CONTAINERS and PLASTIC PRODUCTS

New York Office: *Rockefeller Center, 630 Fifth Ave., Circle 6-2425* • West Coast: *Container Service Co., Los Angeles 27, Cal.*

TIME to solve your HOUSING PROBLEM

ATTENTION PURCHASING AGENTS

Consult INSULATION

(as many manufacturers are doing)

for study and comment

on your custom-molded housing . . .

for production in quantity

for your branch of industry!

Send prints for prompt quotes!

INSULATION MANUFACTURING CO., INC.

Custom Molders of Plastics for Industry

13 New York Avenue • Brooklyn 16, N. Y.

NEW 50 TON IMPCO Plunger or Transfer Machine

- speeds production of small moldings
- economical for producing small orders for larger parts
- ideal for insert work

NO OTHER similar machine on the market can match the speed and efficiency of this new Impco.

Faster loading of pre-forms, faster cull removal and shorter plunger travel are possible with the Impco because the high speed plunger or transfer cylinder is located *beneath* the stationary platen.

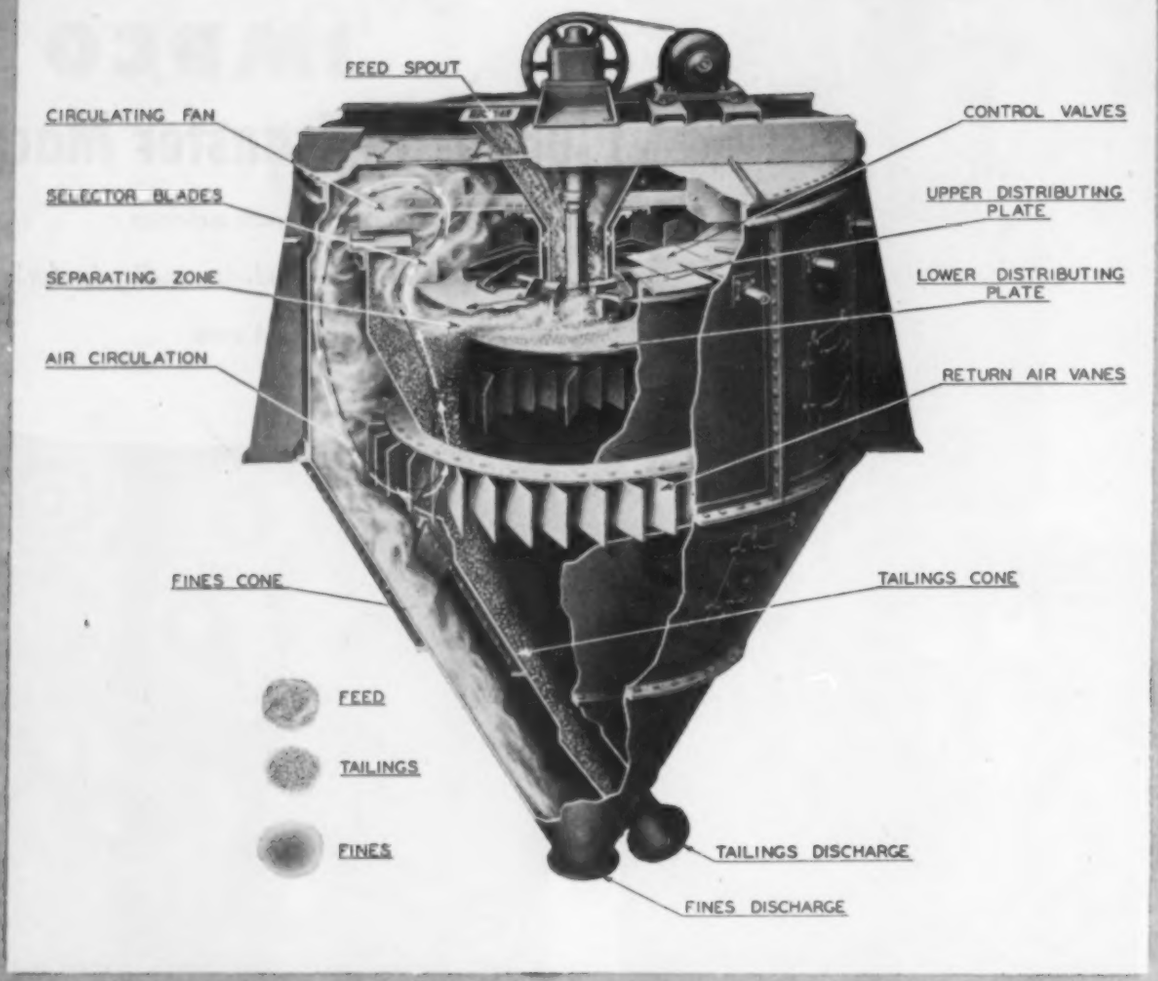
Another unique feature is that the clamping mechanism and the plunger or transfer cylinder pressures can be adjusted to suit conditions as they are *powered by separate pumps*. This is a proven advantage over machines equipped with only one pump.

Why not have a representative call and tell you *all* the advantages of this new machine —what it can mean to *you* in terms of increased production, better work and reduced costs. Better still—come to Nashua and see the Impco machines in action.

MP-8

PLASTIC MOLDING MACHINERY DIVISION

Improved PAPER MACHINERY CORPORATION • NASHUA, NEW HAMPSHIRE



Here's How—

STURTEVANT AIR SEPARATORS

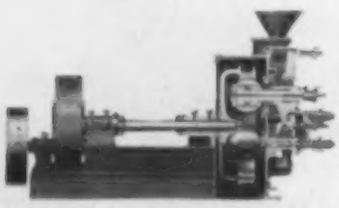
Produce accurate fines with increased output up to 300%

Exact regulation and control of centrifugal forces and air currents, one counteracting and overbalancing the other so precisely that by simple adjustments a product of almost any desired fineness is selected and collected, while coarser sizes are rejected . . . that's the principle of operation of Sturtevant Air Separators.

The benefits you derive from this separator are—increased output by as much as 25% to 300% . . . lower power costs by 10% to 50% . . . reduced maintenance.

A typical on-the-job example is as follows—a 16 ft. separator takes a feed of 750 tons per hour containing only a small percentage of the desired product and delivers 30 tons of material 90%, minus 200 mesh.

Investigate Sturtevant Air Separators today. Write for information and bulletin.



RING ROLL MILL

Capacities from 12 to 18 tons per hour. Range 10 to 200 mesh. Use this mill in closed circuit with Sturtevant Air Separators.

STURTEVANT
MILL COMPANY
110 Clayton Street, Boston 22, Massachusetts
Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

Any way you look at it...

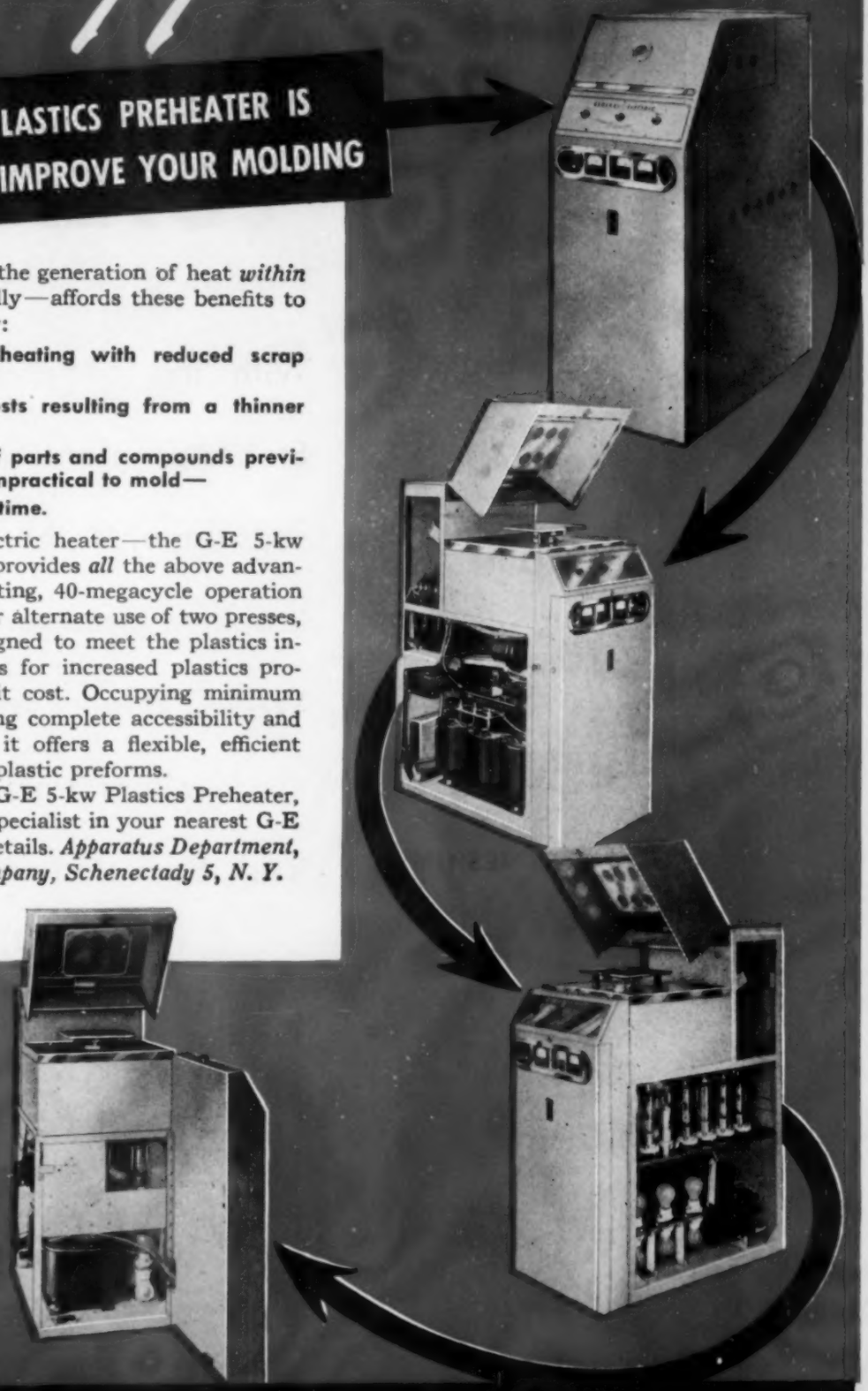
THE G-E PLASTICS PREHEATER IS DESIGNED TO IMPROVE YOUR MOLDING

Dielectric heating—the generation of heat *within* materials electronically—affords these benefits to every plastics molder:

- **Uniform preform heating with reduced scrap losses—**
- **Lower finishing costs resulting from a thinner flash—**
- **Efficient molding of parts and compounds previously considered impractical to mold—**
- **Accelerated curing time.**

One electronic dielectric heater—the G-E 5-kw Plastics Preheater—provides *all* the above advantages. With fast-heating, 40-megacycle operation—with two timers for alternate use of two presses, this preheater is designed to meet the plastics industry's requirements for increased plastics production at lower unit cost. Occupying minimum floor space and having complete accessibility and portability features, it offers a flexible, efficient means of preheating plastic preforms.

For details on the G-E 5-kw Plastics Preheater, contact the heating specialist in your nearest G-E Office. Or, write for details. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



ELECTRONIC HEATERS

GENERAL ELECTRIC

675-148-8741

MORE { WITCO QUALITY STEARATES

from A to Z

- ALUMINUM
- BARIUM
- CALCIUM
- LEAD
- LITHIUM
- MAGNESIUM
- SODIUM
- ZINC

With the completion of our new Stearates plant in Chicago, which supplements the facilities of our Brooklyn plant, prompt shipment of WITCO quality STEARATES can be made either from Chicago or New York. Each shipment represents over a quarter century of experience in the manufacture of Metallic Stearates.

Quality STEARATES for over a quarter of a century

Samples on Request

WITCO CHEMICAL COMPANY
MANUFACTURERS AND EXPORTERS
295 MADISON AVENUE · NEW YORK 17, NEW YORK

LOS ANGELES • BOSTON • CHICAGO • DETROIT • CLEVELAND • AKRON
SAN FRANCISCO • LONDON AND MANCHESTER, ENGLAND

fa-cil-i-ties
Readiness or dexterity proceeding from skill or practice; ease; aptitude; ability to perform by dint of possessing required implements or equipment.
Columbia's sensational production record tells its own story—the most advanced equipment, plus an unbeatable labor-management combination, united to solve the most difficult molding problems.
Columbia
COLUMBIA PROTEKTOSITE CO., INC. • CARLSTADT, N. J.
New York Display Office: Empire State Building
MOLDERS AND MANUFACTURERS OF PLASTIC PRODUCTS

Fuller Brush restyles with Acetate

Brushes molded by Fuller Brush Company from cellulose acetate supplied by Chemaco Corporation. Brushes designed by J. Gordon Lippincott.

IN RESTYLING its line of personal brushes Fuller Brush Company chose cellulose acetate plastics above all other materials. Many requirements had to be met by the plastics selected for this important application.

First, the materials had to be extremely tough and resistant to shattering—to withstand the high-speed drilling of holes and the impact of stapling the bristles during manufacture.

These properties, plus good dimensional stability, were essential service requirements, too—in order to obviate loosening of the bristles or cracking of the handles under varying climatic conditions. Other plastics tested did not possess these desirable properties.

Secondly, the plastics had to be moldable to close dimensions and adaptable to the high speed injection process—so as to faithfully reproduce the new designs with the least finishing, and to meet mass-production demands rapidly.

Finally, from a consumer standpoint, the materials selected had to be light in weight; pleasant to the touch; resistant to soap, hot water, and toilet preparations; and obtainable in hues that would have universal eye-appeal.

In meeting all these needs for Fuller Brush Company, cellulose acetate again demonstrates how high quality styling and unusual durability can be combined with maximum economy.

If *you* have a restyling problem, investigate the cellulosics. While Hercules does not make cellulosic plastics or molding powder, we will be glad to send you helpful technical literature on the Hercules base materials from which they are made.

HERCULES POWDER COMPANY
INCORPORATED
916 Market Street, Wilmington 99, Delaware

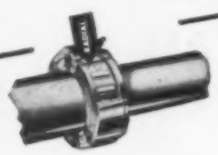
CP7-10

Save and Sell with Cellulosic Plastics

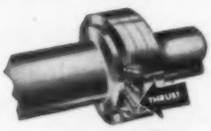
CELLULOSE ACETATE • ETHYL CELLULOSE • NITROCELLULOSE

Why RIGHT ANGLE LOADING ASSURES LONGER BEARING LIFE

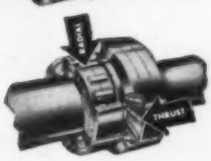
Right Angle Loading splits compound loads into the two component parts of pure radial and pure thrust . . . and carries each of these components on separate bearing assemblies.



- When the load is pure radial, it bears at a right angle to the rollers.



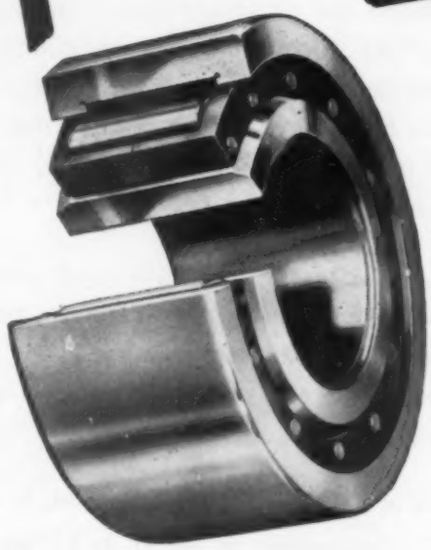
- When the load is pure thrust, it bears at a right angle to the rollers.



- When radial and thrust are combined the two loads are resolved separately at a right angle to the rollers.

ROLLWAY

RIGHT-ANGLE-LOADED BEARINGS



Reduce shut-downs and maintenance costs

They prevent wedging of rollers and pinch-out. Reduce roller end-rub with its wearing friction. Eliminate complicated stresses. Substantially reduce unit pressures. Eliminate compound or oblique loads, and the resultants of oblique loads. Carry greater radial or thrust load capacity in any given dimension. Assure greater resistance to shock loads and vibration. Give longer life expectancy.

FREE SERVICE!

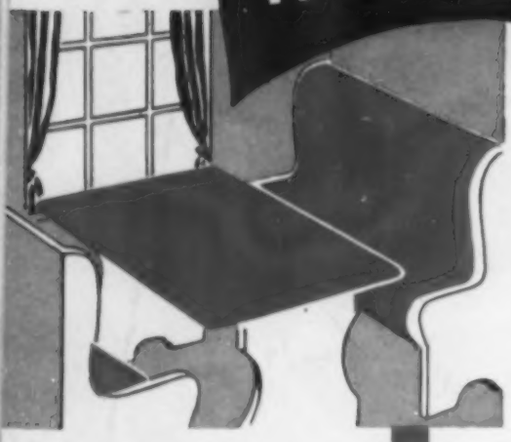
Send us a print or detailed statement of load, speed and operating conditions for free analysis and recommendation. Your information is held confidential.

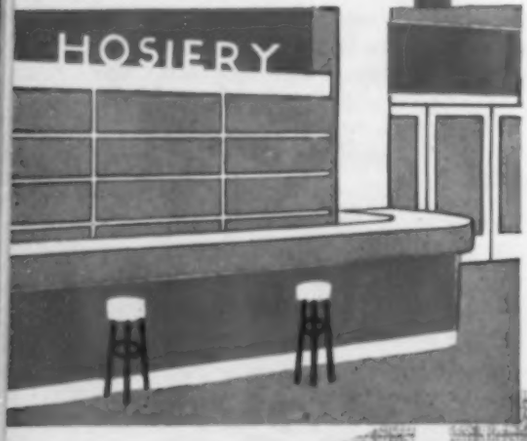
ROLLWAY BEARINGS

ROLLWAY BEARING COMPANY, INC., SYRACUSE, N. Y.

SALES OFFICES: Philadelphia • Boston • Pittsburgh • Cleveland • Detroit • Chicago • Minneapolis • Houston • Los Angeles

WESTPLAK *is here*





THE NEW LOW-COST HIGH-DENSITY LAMINATE FOR TOPS — PANELS — WALL SURFACES

• EASY TO INSTALL

• AVAILABLE IN ROLLS OR SHEETS

WESTPLAK is the first decorative continuous laminate on the market available now in rolls or sheets of various thicknesses. It can be used for wall surfaces, table tops, furniture surfaces in stores, restaurants, theatres and institutions.

WESTPLAK won't crack, chip or dent. It is stain-proof, alcohol-proof, resists acids and is easy to clean. It withstands boiling water to degree never before obtained with a continuous laminate.

EASY TO INSTALL — With the aid of simple tools, the ordinary workman can install WESTPLAK. It can be bent cold around a 2" radius or, it can be heated and bent around a ½" radius. This means that for the first time a laminate can be easily installed on the job. This easy-to-install quality also makes WESTPLAK suitable for mass production methods.

AVAILABLE — There are, at present, 30 distributors located throughout the United States who have WESTPLAK in stock in standard sheet sizes and various thicknesses. It is available in blue linen, tan linen, red linen, solid red and solid black. Special patterns and colors can be supplied.

SIZES: Sheets are available in 6', 8', 10' and 12' lengths; in widths of 24", 30", 36" and 42". Thicknesses of 1/16", 1/32" and .015"

WESTERN PRODUCTS INCORPORATED

NEWARK OHIO

Look what you can do with WESTPLAK

YOU CAN HANDLE THE CURVES with perfect ease. The strip of WESTPLAK illustrated here was bent with the aid of a small amount of heat without any special equipment. This will illustrate how WESTPLAK can be installed on columns, radio cabinets, furniture, sink tops or curved bar or wall surfaces.

YOU CAN COVER LONG AREAS because WESTPLAK is available in continuous rolls. If your surface is 20 or 200 feet long, WESTPLAK will cover the job in one piece which eliminates fitting and joining. All the work can be done on the job.

COMPLETE INSTRUCTIONS AVAILABLE. For installing WESTPLAK an instruction book is supplied which lists the tools you need, tells, in simple, understandable language, how to lay out WESTPLAK, cut it and install it. Also gives suggestions for making simple bending equipment, sawing with power tools, cementing, molding and accessories.

Clip coupon and mail for free booklet on WESTPLAK.

Our engineering staff is available for consultation on industrial applications.

WESTPLAK

new plastic covering for

TABLES
COUNTERS
SINKS
DOOR PANELS
WALL PANELS

WESTERN PRODUCTS INCORPORATED
Newark, Ohio

Gentlemen:

WESTPLAK may help us reduce costs and improve appearance. We are interested in its use for.....

☐ Send us literature, ☐ prices, ☐ name of distributor near us.

Name.....

Company.....

Address.....

Pfizer PLASTICIZERS

TRIETHYL CITRATE ★ Easily compatible with most resins. Low oil solubility makes it of especial interest as a plasticizer for products which may come in contact with fats and oils.

ACETYL TRIETHYL CITRATE ★ Less volatile and more water-resistant than the unacetylated ester. Particularly recommended for cellulose acetate. Possesses good oil resistance.

TRIBUTYL CITRATE ★ A general-purpose plasticizer of low volatility and good water resistance which is compatible with most resins. Has proved to be an excellent foam-breaker in many cases.

ACETYL TRIBUTYL CITRATE ★ Its very low volatility and high water resistance renders this plasticizer particularly valuable for various types of films, cast or extruded. Also recommended for any product in which low volatility is of especial importance.

For further information please inquire of Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 444 West Grand Ave., Chicago 10, Illinois; 605 Third Street, San Francisco 7, Calif.

PFIZER QUALITY

PFIZER

Manufacturing Chemists Since 1849

9285

Cut YOUR FLOOR SPACE REQUIREMENTS with NEW G. & L. *Vertical* PLASTICS INJECTION MOLDING MACHINE

Use Space Saved for Additional Equipment to Increase Molding Capacity . . .

G. & L. Vertical Design, Integral Hydraulic Unit and Single Cylinder Operation Make This Possible

You can now utilize more of your valuable floor space to increase molding capacity by installing G. & L. Vertical Plastics Injection Molding Machines.

These completely self-contained *vertical* machines offer simple, advanced structural features which reduce floor space requirements as much as 50%. It is no longer necessary to give up critically needed floor area to conventional molding equipment having complex multiple horizontal space consuming mechanisms.

Then too, in half the floor room, the G. & L.'s vertical construction offers the molder easy accessibility to all machine parts. This simplifies and speeds production molding with less effort on his part.

ADDITIONAL VERTICAL DESIGN ADVANTAGES FOR PROFITABLE MOLDING

Quick substitution of heating cylinders ends time consuming shutdowns for material changeover and purging.

Vertical construction facilitates mold handling.

Horizontal mounting of dies offers extensive insert molding possibilities.

High toggle strain is eliminated through single direction of toggle and injection pressures.

Only one hydraulic cylinder is required to close dies and inject plastics material, resulting in reduced maintenance cost.

Vertical movement of die on strain rods eliminates rod sag common to conventional machines.

Centralized machine controls are convenient to the operator.

All electrical circuits are interlocked to provide maximum safety during operational cycle.

G. & L. OFFERS WORTHWHILE ENGINEERING HELP

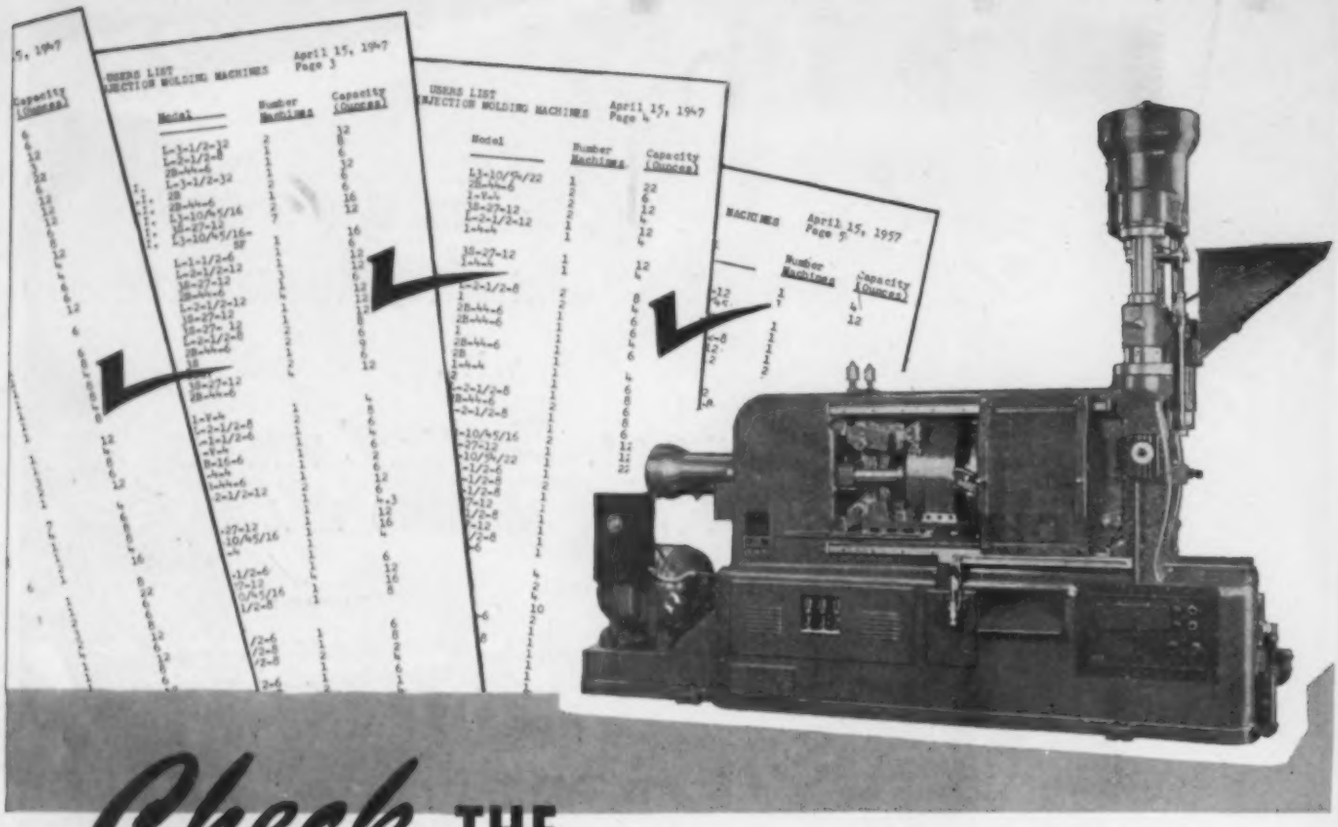
G. & L. engineers will be glad to discuss your molding problems and offer a practical solution. Just outline your individual needs.

G&L

GIDDINGS & LEWIS MACHINE TOOL COMPANY

PLASTICS DIVISION

FOND DU LAC . . WISCONSIN . . U.S.A.



Check THE LESTER USER'S LIST *before buying molded plastics*

● Close to every buyer of molded plastics, there's a custom molding shop equipped with the world's finest molding equipment . . . the *new* LESTER injection molding machines.

On behalf of these hundreds of LESTER-equipped plants, we invite you to "check the LESTER user's list before buying molded plastics" . . . and here is our reason . . .

Users of LESTER injection molding machines have the only really *new* molding equipment on the market . . . Unique LESTER features such as the exclusive cast alloy steel one piece frame . . . vertical injection system . . . absolute control of *both* injection speed and injection pressure . . . these and other exclusive LESTER improvements insure economical, top-speed production of the finest in molded plastics.

Get acquainted with the LESTER users in your community . . . get the best in molded plastics for yourself and your customers.

Write Today... for your copy of LESTER user's list and we will send it by return mail.

NEW YORK
CHICAGO
LEOMINSTER
CINCINNATI
LOS ANGELES
SAN FRANCISCO

This is the fourth of a series of advertisements on behalf of our customers, the world's best injection molders.

INJECTION MOLDING MACHINES

Distributed by **LESTER-PHOENIX, INC.**
2621 CHURCH AVE., CLEVELAND 13, OHIO

Molded and Assembled by Delta Electric Company, Marion, Indiana

"Light Heavyweight"

Tipping the scales at a mere 37 ounces, the Delta Reddylite nevertheless turns in a champion heavyweight's performance. Take the housing, for instance. Made of Chemaco Ethyl Cellulose it is exceptionally light (5.47 ozs.), tough, rustproof, non-tarnishing, integrally colored and amazingly resistant to impact. In camp, home and industry it absorbs terrific punishment without chipping, cracking or breaking. Today's new formulations of Chemaco Ethyl Cellulose—brighter and better in color, finer in finish and with greater dimensional stability than any other cellulosic—*impart custom-made quality to articles manufactured by the million.* Furthermore, recent price reductions and low specific gravity produce more pieces per pound at lower cost. Why not let us help you with your problems. Write today for our new booklet. Chemaco Corporation, Berkeley Heights, N. J. Branch office in Cleveland.

Chemaco

ETHYL CELLULOSE PLASTIC MOLDING POWDERS

Also Manufacturers of Cellulose Acetate and Polystyrene

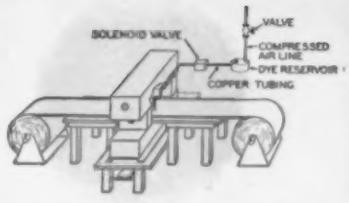
DURITE
PLASTICS

MOLDING COMPOUNDS

Durite General Purpose Phenolic Compound was selected for molding this Relay and Fuse Block with Relay Insert. The specifications called for a material having unusually good moldability, dependable electrical properties, dimensional stability, and strength.

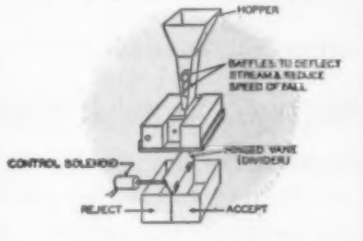
DURITE PLASTICS INCORPORATED • 5000 Summerdale Ave. • Philadelphia 24, Pa.

PAID FOR ITSELF THE FIRST DAY!



INSPECTION OF CONTINUOUS STRIP

An ideal set-up for plastic sheeting and film. When metal is detected, air pressure sprays dye on the contaminated portion. Many modifications possible to fit varying needs.



INSPECTION OF FALLING MATERIAL

A good way to inspect molding powders, fillers, and resins. When metal is detected, the hinged vane deflects the stream into the reject bin.

RCA Electronic Metal Detector scans plastic rolls, protects calender at National Automotive Fibres

"In one operation our RCA electronic metal detector saved us $2,000," reports National Automotive Fibres, Inc., Trenton Division.

"By detecting a fairly large piece of tramp metal embedded in the plastic scrap we were processing, it prevented severe damage to our calender roll . . . saved the cost of an expensive regrinding operation."

In this plant, a preliminary visual inspection of scrap plastics eliminates obvious pieces of metal. After the plastic has gone through the milling roller, the rolls are carried on a conveyor belt through the detector's inspection aperture. If metal is present, a bell rings, the roll is removed and unwound, and the particle is eliminated.

This modern electronic equipment can spot every type of metal and alloy—magnetic or nonmagnetic, regardless of its depth in the material. Reports on units in use for more than two years attest to its reliability—even in detecting particles as small as 70 thousandths of an inch in diameter!

Here's a unique opportunity to protect your valuable tools, dies, molds, engraved rolls, and calenders . . . reduce lost production time . . . safeguard product quality . . . preserve customer good will. It will pay you to get complete information immediately. Write Dept. 55-J.

RCA

INDUSTRIAL ELECTRONICS

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

You'll get better plastic products

at WATERTOWN

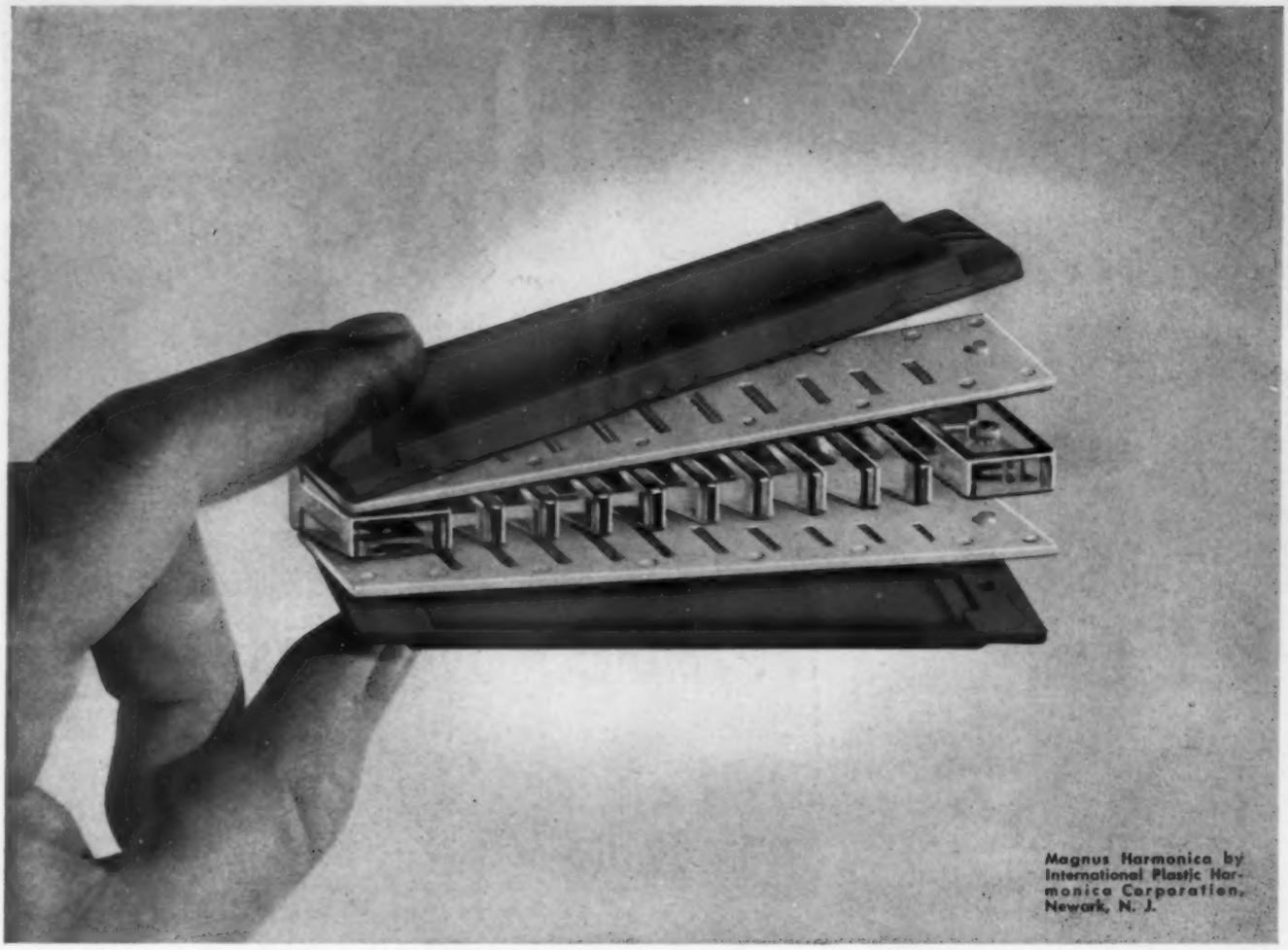
When you're in need of plastic parts, large or small, of intricate or simple design, you'll do better at WATERTOWN. Here you'll find experience of some thirty-five years of supplying the plastic requirements of some of the nation's leading industries. Here too is the finest equipment available to handle the custom molding of thermo-setting or thermoplastic materials. A complete testing laboratory is available in order to make your products *better* than most. We shall be happy to assist you in any way possible. Send us your difficult problems and be assured of the finest service. . . .

THE WATERTOWN MANUFACTURING COMPANY
1000 ECHO LAKE ROAD WATERTOWN, CONNECTICUT
NEW YORK CLEVELAND CHICAGO DETROIT MILWAUKEE

Watertown

A NAME AS OLD AS THE PLASTICS INDUSTRY

"This advertising message, appearing in 4-color cover position in NEWSWEEK, BUSINESS WEEK and U. S. NEWS. is developing business for Monsanto Lustron molders and fabricators."



Magnus Harmonica by International Plastic Harmonica Corporation, Newark, N. J.

5 parts with Lustron —instead of 80

A MONSANTO PLASTIC

With Lustron, Monsanto's polystyrene, this harmonica manufacturer gets a long lead and more profit in a big market. Formerly, each harmonica was assembled from 80 parts, requiring 150 operations. Today, with Lustron, a better product is produced . . . *with only 5 parts, assembled in just 15 seconds, with 7 operations.*

Moreover, Lustron molds speedily in the fastest mass production techniques. Light weight plus low cost per pound gives more items per material dollar. Expensive finishing operations are eliminated. All waste is salvageable at full value. Monsanto Lustron offers a rainbow range of sales appealing colors—clear and opaque. It has low temperature strength, high dimensional stability, excellent resistance to alkalies, acids and water.

MONSANTO
CHEMICALS — PLASTICS

Let Monsanto plastics engineers show you how to speed products to market with more profits, via Lustron. Write: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Mass. In Canada: Monsanto (Canada) Limited, Montreal.

The broad and versatile family of Monsanto Plastics includes: Lustron* polystyrenes • Cerex* heat resistant thermoplastics • Vinyls • Nitron* cellulose nitrates • Fibestos* cellulose acetates • Thalid* resin • Resinox* phenolics • Resimene* melamines • Forms in which they are supplied include: Sheets • Rods • Tubes • Molding Compounds • Industrial Resins • Coating Compounds • Continuous Films • Vuepak* rigid, transparent packaging materials. Saflex* safety glass interlayers.

*Reg. U. S. Pat. Off.

SERVING INDUSTRY . . . WHICH SERVES MANKIND

New Orleans welcomes the plastics industries

The Foreign Trade Zone speeds commerce and facilitates international trade.

International Trade Mart, where the products of the world are displayed for wholesale trading.

LET US SEND YOU FREE . . .

a copy of our recently completed study, "The Opportunity for the MANUFACTURE of PLASTICS and PLASTIC PRODUCTS in the City of New Orleans", giving more detailed information on the profitable possibilities of a New Orleans location. Write:

GREATER NEW ORLEANS, INC.,
1024 Maison Blanche Bldg., New Orleans 16, La.

. . . Means More PROFITS for YOU!

MARKETS MEAN PROFITS! . . . Here, your plant is situated *midway* between the eager domestic and foreign markets . . . at home, the vast Mississippi Valley and 10 progressive southern states which need more plastics than they produce . . . and below us, the rapidly increasing Latin American and Caribbean market which imported more than $17,000,000 of plastic materials and products in 1946. About half of the Latin American republics neither manufacture their own plastic materials nor fabricate semi-finished forms of plastics.

RESOURCES MEAN PROFITS! . . . Raw materials native to Louisiana in quantity include cotton, wood pulp, soda ash, sulphur, bagasse, and petroleum derivatives, acetic acid, benzol, formaldehyde, resins and acrylic acid. In addition, many substances used in the manufacture of plastic materials are imported through the Port of New Orleans and are available, as, for example, casein and castor beans. Of great importance too is the unlimited supply of low cost natural gas from deep wells near the city, and ready, economical electrical power.

TRANSPORTATION MEANS PROFITS! . . . From the large, sheltered harbor 97 ship and barge lines send deep-draft vessels to the seaports of the world, and modern barges inland economically over a 15,000 mile waterways system. Nine trunk line railroads converge here, and 8 major air lines, 24 motor freight lines. Besides these essentials for industrial profit, New Orleans offers the unequalled trade facilities presented by International House, International Trade Mart and the Foreign Trade Zone. The supply of *Skilled Labor* has more than doubled since 1940, and *Friendly Taxation,* local and state, encourages industrial growth. Investigate now.

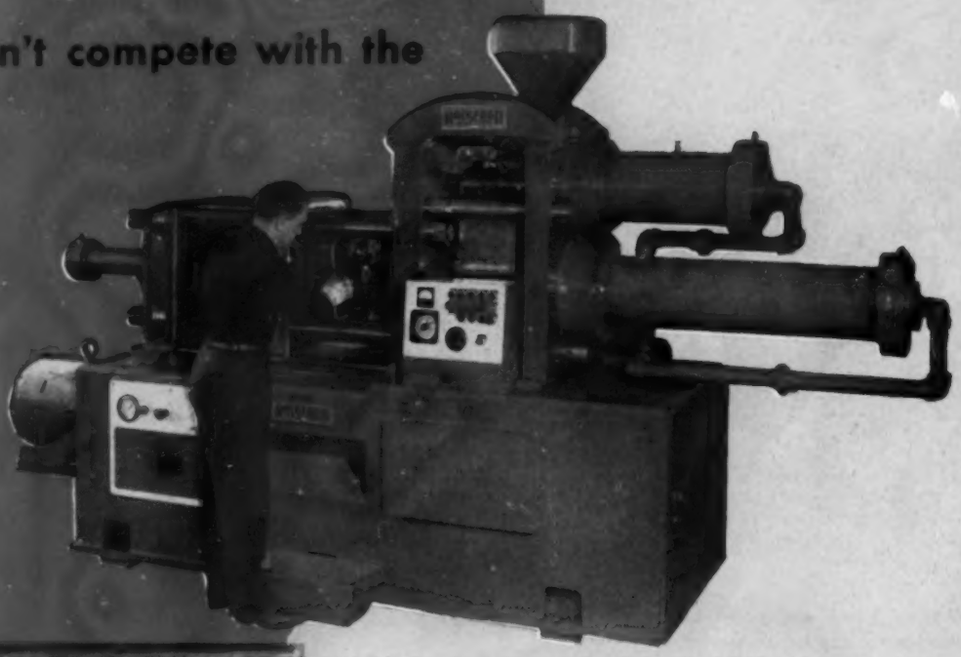
GREATER NEW ORLEANS

MARKETS TRANSPORT RESOURCES

YOUR NEWEST MACHINES

are obsolete....

if they can't compete with the



ROCKFORD HY-JECTOR

WRITE FOR BULLETIN 147

•

Gives complete descriptive information. Better yet . . . send us details on type of parts you are molding in thermosetting materials and we'll supply production estimates without obligation.

•

4716

fully automatic production from POWDER to FINISHED PARTS with THERMOSETTING MATERIALS

Set the ROCKFORD HY-JECTOR for powder-volume-selection, preform size and density, preheat time and temperature, molding pressure, and curing time and temperature . . . and from then on your machine operator's only job is to keep the hopper full and remove finished parts. This proved, high-speed machine offers every production advantage you might want. It is the engineered answer to the question asked molders, "What would be the perfect machine for production in thermosetting materials?" Write for the facts now. See for yourself the wide-range advantages that only the ROCKFORD HY-JECTOR can offer.

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

FOR THE METALWORKING INDUSTRY

Hy-Draulic

PLANERS and SHAPER-PLANERS · SHAPERS · SLOTTERS

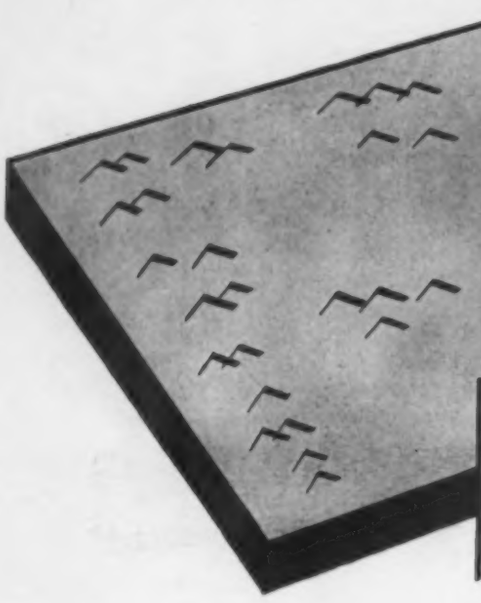
FOR MOLDING

ROCKFORD HY-JECTOR

THERMOSETTING PLASTICS

UNION PACIFIC

TREASURE MAP OF INDUSTRY



Wyoming

- ☆ VAST SUPPLY OF COAL, IRON AND PETROLEUM
- ☆ LEADING LIVESTOCK STATE
- ☆ TREMENDOUS WOOL CLIP
- ☆ IMPORTANT MARKETING CENTER OF POULTRY AND DAIRY PRODUCTS
- ☆ LARGE PRODUCER OF SUGAR BEETS, POTATOES AND GRAINS
- ☆ EXCELLENT TRANSPORTATION
- ☆ OUTSTANDING SCENIC AND RECREATIONAL ATTRACTIONS
- ☆ HEALTHFUL LIVING CONDITIONS

✳ *One of a series of advertisements based on industrial opportunities in the states served by the Union Pacific Railroad.*

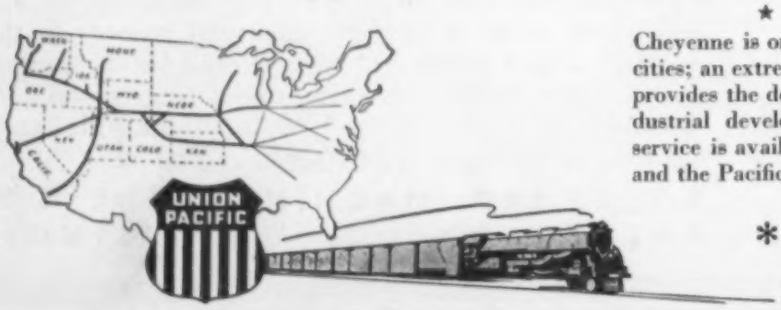
In Wyoming manufacturers will find a vast amount of raw materials. It is a leading state in potential mineral resources; produces great quantities of iron . . . has the world's largest untapped supply of coal. Copper, silver, gold, lignite and bentonite are among the mined metals and minerals. The State contains 27 oil fields and large timber lands.

Wyoming is one of the greatest of livestock States, producing fine beef cattle. Its wool clip is tremendous. Poultry raising and dairying are important activities. Principal crops are sugar beets, potatoes and grains.

The healthful climate . . . scenic and recreational attractions such as Yellowstone-Grand Teton National Park and scores of dude ranches . . . a fine educational system . . . are incentives to living in this western region.

★ ★ ★ ★

Cheyenne is one of the principal Union Pacific mainline cities; an extremely important point to the railroad which provides the dependable transportation so essential to industrial development. For travelers, daily Streamliner service is available from Cheyenne to and from Chicago and the Pacific Coast.



✳ *Address Industrial Department, Union Pacific Railroad, Omaha 2, Nebraska, for information regarding industrial sites.*

UNION PACIFIC RAILROAD

THE STRATEGIC MIDDLE ROUTE

(Translucent table lamp, molded for All-Lite Manufacturing Co., Chicago)

Plastics . . . *in a new light*

This lamp, a new departure in household illumination, also casts its light on our molding versatility. It serves as an excellent example of the ideal combination of beauty and functional dependability possible through the *correct* use of plastics. The lamp radiates light the entire length of its translucent shaft instead of just from a conventional type bulb at the top. Its design, while beautifully simple, required a high degree of our imagineering* skill to execute.

If you have a product with a new departure—a product that would reach its highest degree of excellence through the *proper* use of plastics, bring it to us. The result will bring you plastics in a brilliant new light.

*Imagination plus engineering skill.

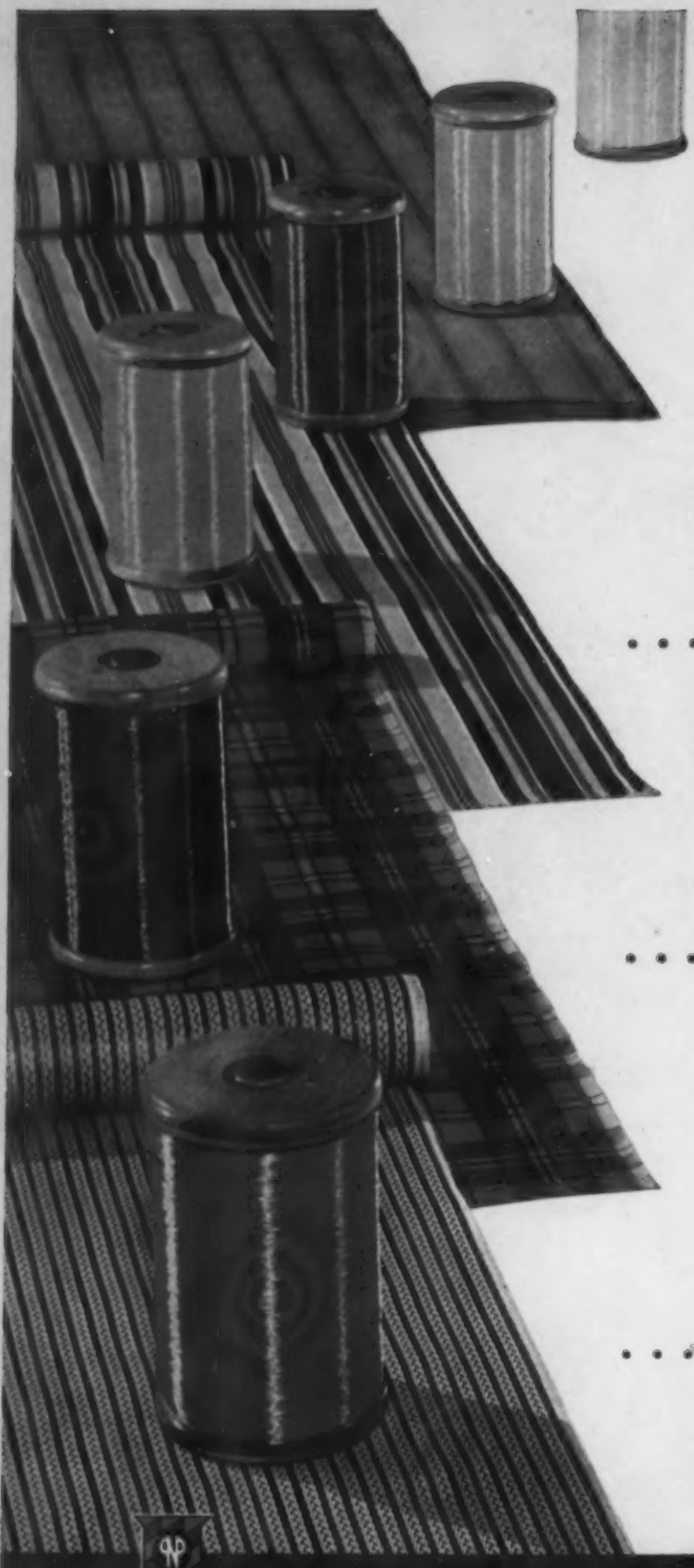
Write on your letterhead for the new Injection Molded and Extruded Plastics catalogue. Or, for detailed information about [illegible]* pipe, tubing and fittings, write for circulars containing data and illustrations.

ELMER E. MILLS CORPORATION

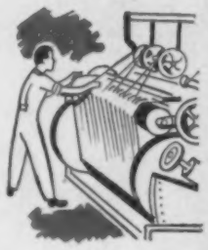
INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Plexiglas, Nylon, Polystyrene, Styron, Lustron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Cerex, Forticel, [illegible]*, Saran, and other Thermoplastic Materials.

153 WEST HURON STREET • CHICAGO 10, ILLINOIS

*Trademark Reg.



Saran BY NATIONAL monofilaments



Rich colors, exciting textures and thrilling patterns are coming off the looms these days. They are fabrics woven of SARAN monofilaments and they are making strides in the textile industry in larger and larger quantities.

. . . easy to weave

The gorgeous beauty of these fabrics isn't the only reason for this growing swing to SARAN. These flexible filaments — now available as fine as .005"—make the going easy for makers of upholstered furniture and auto seat covers.

. . . easy to work

They invest the fabrics with a durability that's unbelievable . . . with an indifference to dirt and stains . . . a complete disregard for scuffing and rough usage. Small wonder, then, that SARAN monofilaments lead a direct line of topmost saleability right into the store where finished SARAN-woven products are sold.

. . . easy to sell

SARAN BY NATIONAL denotes monofilament, rattan and tape manufactured by The National Plastic Products Company from Saran, a vinylidene chloride copolymer made by The Dow Chemical Company and supplied to mills, weavers and other fabricators for specific end uses.

The NATIONAL Plastic Products Company

ODENTON · MARYLAND

© 1947 T.N.P.P. CO.

NEW YORK: EMPIRE STATE BUILDING · LOS ANGELES: BANKERS BUILDING

A CRYSTAL THAT GREW FROM A SEED . . . *The large crystal in the foreground is an EDT (Ethylene Diamine Tartrate) crystal. It started from a seed (a piece of mother crystal) and in three months grew in a slowly cooling solution to the size shown. The small plate is cut from a large crystal, then gold-plated for electrical connection and mounted in vacuum. Cultivated EDT crystals can do the same job as quartz in separating the nearly 500 conversations carried by a coaxial circuit.*

Crystals for Conversations

AT WAR'S END, the Bell System began to build many more Long Distance coaxial circuits. Hundreds of telephone calls can be carried by each of these because of electric wave filters, which guide each conversation along its assigned frequency channel. Key to these filters was their frequency-sensitive plates of quartz.

But there was not enough suitable quartz available to build all the filters needed. Bell Telephone Laboratories scientists met the emergency with cultivated crystals. Years of research enabled them to write the prescription at once—a crystal which is grown in a laboratory, and which replaces quartz in these channel filters.

Now Western Electric, manufacturing unit of the Bell System, is growing crystals by the thousands. Many more Long Distance telephone circuits, in urgent demand, can be built, because the scientists of Bell Telephone Laboratories had studied the physics and chemistry of artificial crystals.

BELL TELEPHONE LABORATORIES

EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

Have you considered TRIOXANE as a source of Anhydrous Formaldehyde?

HERE's a new chemical which may solve some problems in organic synthesis, particularly those where yield and quality of product are of great importance. It is a formaldehyde polymer—a special form of formaldehyde which may be used to carry out many reactions heretofore considered impracticable or impossible with formaldehyde or its usual polymers.

TRIOXANE

Cyclic trimeric polymer of Formaldehyde

PROPERTIES

Colorless, crystalline compound	
Molecular Weight	**90.05**
Odor	**Mild, Pleasant**
Melting Point	**61°C**
Boiling Point	**115°C**
Vapor Pressure	
25°C	13 mm
86°C	283 "
114.5°C	759 "
129°C	1212 "
Flash Point (Open Cup)	**44°C**
Density (molten) @ 65°C	**1.170**
Solubility	
Water	Readily Soluble
Alcohols	" "
Ketones	" "
Ethers	" "
Esters	" "
Chlorinated Hydrocarbons	" "
Aromatic Hydrocarbons	" "
Naphthalene	" "
Phenol	" "
Vegetable Oils	" "
Petroleum Ether	Slightly Soluble

With Trioxane, unusual and profitable reactions are possible because:

1. *It is readily soluble in most organic agents with the exception of paraffin hydrocarbons.*

2. *Of itself, it's an excellent solvent for many classes of materials, even at low temperatures.*

3. *It permits ready preparation of homogeneous non-aqueous reaction mixtures.*

4. *It's highly compatible in both neutral and alkaline non-aqueous solutions. Under these conditions, Trioxane acts like a stable, cyclic ether.*

5. *Stable systems containing Trioxane can be depolymerized to yield monomeric formaldehyde by the action of acid catalysts or by pyrolysis.*

6. *The depolymerization or conversion of Trioxane to formaldehyde can be carried out at a controlled rate.*

Trioxane thus can be used as a source for formaldehyde in reaction with phenols, substituted phenols, hydrocarbons, alcohols and amine hydrochlorides. In general, it is suitable for all types of organic reactions in which acidic catalysts are not incompatible with the reagents. For example, solvents are not required to carry out Mannich-type synthesis for the Trioxane acts as a solvent until it has been converted to formaldehyde and taken part in a desired reaction. The reaction mixture is thus converted quantitively to the reaction product.

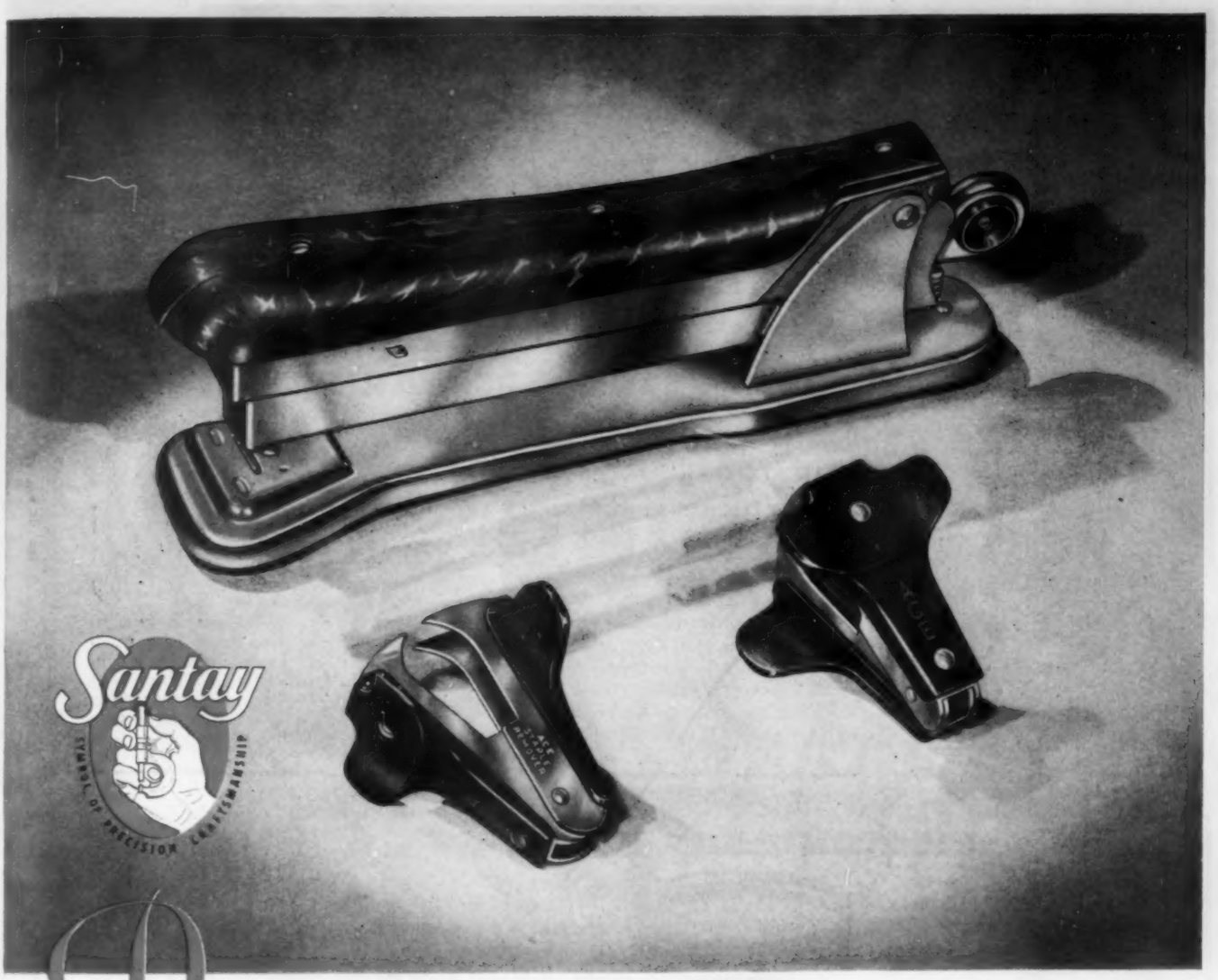
The properties of Trioxane suggest that it may have a wide variety of other industrial possibilities, e.g., as a plasticizer for other materials where its volatility is not objectionable.

FOR TECHNICAL ASSISTANCE and copies of Bulletin F-300-1146, which gives more information about Trioxane, write or call our nearest District Office. E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington 98, Delaware.

DISTRICT OFFICES: Baltimore, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, El Monte, New York, Philadelphia, Pittsburgh, San Francisco.

DU PONT ELECTROCHEMICALS

DU PONT BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



Plastics IN THEIR PLACE

If we were to dream up a use for plastics, we couldn't think of a better one than this . . the Aceliner streamlined Stapler and the Ace Staple Remover*. Here's a combination of plastics and metal that's hard to beat.

Added to the durability and strength of metal, are all the durability, strength and *colorful beauty* of properly designed and molded plastic parts. Little is left to be desired in sales appeal or utility value. Wear resistant, strong but light in weight, adapting themselves with their integral color and finish to their surroundings, these plastic pieces are indeed *in their correct place!*

Even if you can't think of a better use of plastics than this, but perhaps have an idea for developing a new product or improving an old one, we would certainly enjoy discussing it with you. Why not submit your next problem to SANTAY? We've been lending valuable aid to manufacturers for over twenty-five years.

*Molded for Ace Fastener Corp.

INJECTION MOLDING AND METAL STAMPING • ELECTRO-MECHANICAL ASSEMBLIES

SANTAY CORPORATION, 355 NORTH CRAWFORD AVE., CHICAGO 24, ILLINOIS

REPRESENTATIVES: BURTON SALES CO., BRISBANE BLDG., BUFFALO 3, N.Y. • QUEISSER BROS., 110 E. 9th ST., INDIANAPOLIS 2, IND. • PAUL W. SEILER, 2779 CORTLAND AVENUE, DETROIT 4, MICHIGAN • C. E. WHITE & CO., BULKLEY BLDG., CLEVELAND 15, OHIO • WILLIAM S. RICHARDS COMPANY, 4903 DELMAR BOULEVARD, ST. LOUIS 8, MISSOURI.

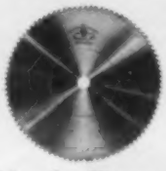
DISSTON CUTTING TOOLS

. . . for faster, better cutting of plastics . . . and for longer tool life

DISSTON CIRCULAR SAWS

Disston makes a complete line of circular saws for the cutting of all types of plastics from thin wall tubing to highly abrasive laminated materials.

SOLID TOOTH



Disston Solid Tooth Circular Saws are supplied with set teeth, hollow ground or a combination of both . . . in four different steels, tempered either for filing or grinding. Also supplied fitted with tungsten carbide tips. There is a wide variety of teeth patterns, each designed to meet definite plastics cutting needs. In all standard diameters and gauges . . . and for all machines.

INSERTED TOOTH INSERTED SECTION

Disston Inserted Tooth or Inserted Section Circular Saws for plastics cutting are fitted with cemented tungsten carbide inserts, which are brazed on surfaces to keep them firmly in position. Shape of teeth and spacing are varied to suit operating conditions and material to be cut. These saws retain their cutting edges longer than other circular saws used for plastics cutting, hence require less frequent sharpening.

DISSTON BAND SAWS

The toughness and high flexibility of these saws enable them to withstand the constant bending and straightening even on small wheel, high speed machines. Supplied in two types for plastics cutting, each made of durable Disston Steel: (1) HARDENED THROUGHOUT

for cutting of hard and abrasive plastics, and for operating at speeds of 2000 to 4000 f.p.m.; and (2) HARD EDGE FLEXIBLE BACK for speeds of 800 to 1000 f.p.m. Two different sets: Straight and Raker. In all standard sizes.

DISSTON

CARBOLOY-FITTED SAWS, CUTTERS and SHAPER KNIVES

Recommended for use in shaping laminated phenol resinoid and other plastics with similar cutting characteristics. Supplied in a number of standard patterns, Disston Carboloy-Form Cutters and Shaper Knives are made to your specifications. Fitted with Carboloy to assure fast, clean cutting and long tool life. Bevels on edge of knives are accurately ground to provide a perfect fit in the collars. Also supplied in solid steel for high speed machines.

DISSTON BITE-RITE FILES

for HAND USE . . . for MACHINE USE

An exclusive product of Disston engineering that combines speed, long life and exceptionally smooth work. Teeth are clean, strong and sharp; cut at correct angles; uniform in width and depth; and staggered for straighter, faster, smoother cutting. Improved heat treatment gives Disston Bite-Rite Files an unusually long life. Supplied in all standard cuts, shapes and sizes . . . for hand or machine use . . . and for all materials.

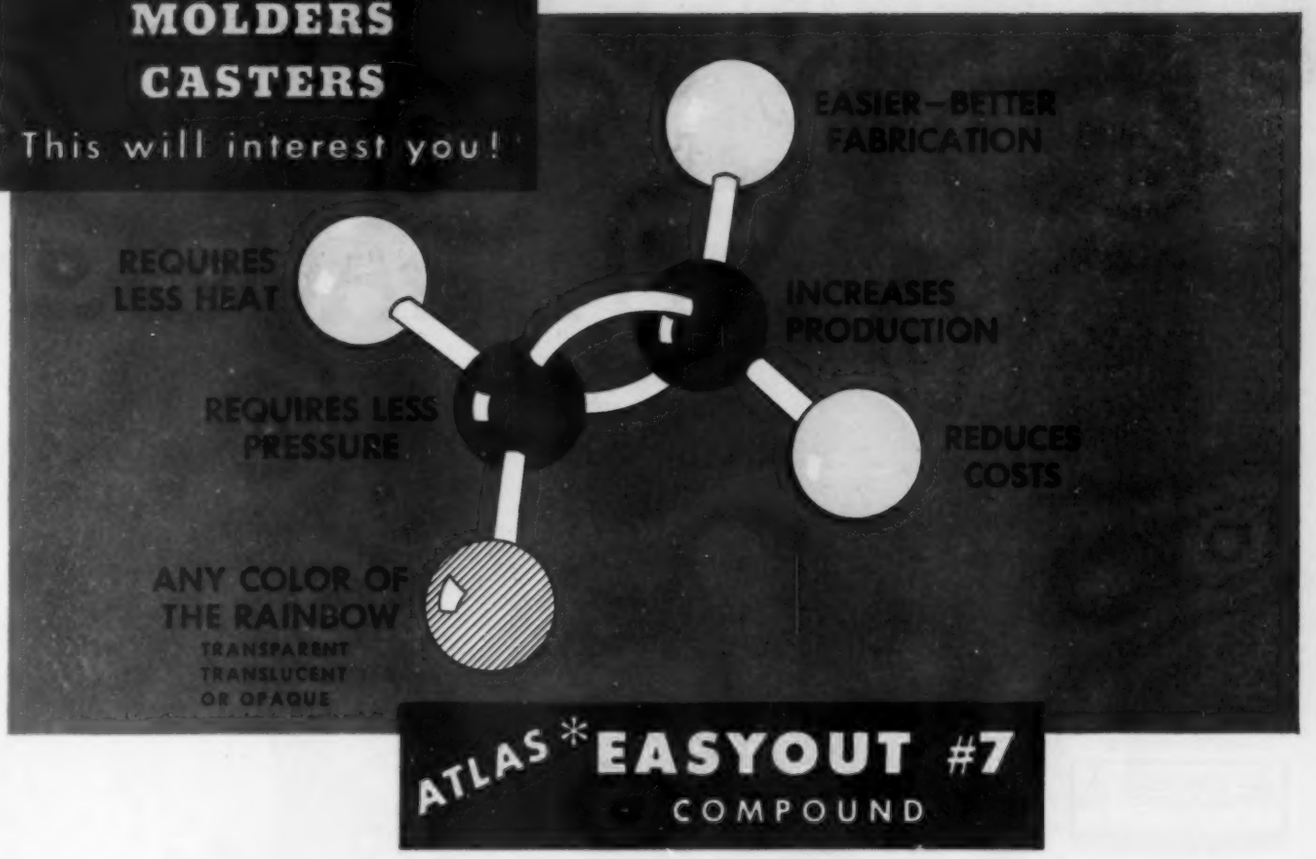
Order from your Disston Distributor or write direct for further particulars.

STEEL—Everybody who wants to obtain steel can help himself to get it by immediately starting scrap into the channels that serve steel mills.

ESTABLISHED 1840 REG. U.S. PAT. OFF.

HENRY DISSTON & SONS, INC., 1034 Tacony, Philadelphia 35, Pa., U.S.A.

EXTRUDERS
MOLDERS
CASTERS
This will interest you!



ATLAS * EASYOUT #7
COMPOUND

Increase your Production At least 20%

Plastic fabricators – here's a thermoplastic polyvinyl chloride compound that will step up your production at least 20%.

Easier Fabrication

EASYOUT #7 lessens the number of operations, reducing manufacturing costs. Its ease of fabrication is an outstanding factor. Requiring less heat and less pressure, your machines last longer.

Production Dollars Go Farther

Compounded to your special requirements in quantities of 50 pounds or a carload. Always uniform – always dependable. EASYOUT #7 has many other advantages, let us tell you about them in detail. MAKE YOUR PRODUCTION DOLLARS GO FARTHER. Phone, wire or write.

WIRE COATERS

Here's a natural that you've always hoped for. A chance to improve your coatings, increase production and lower your costs to meet competition.

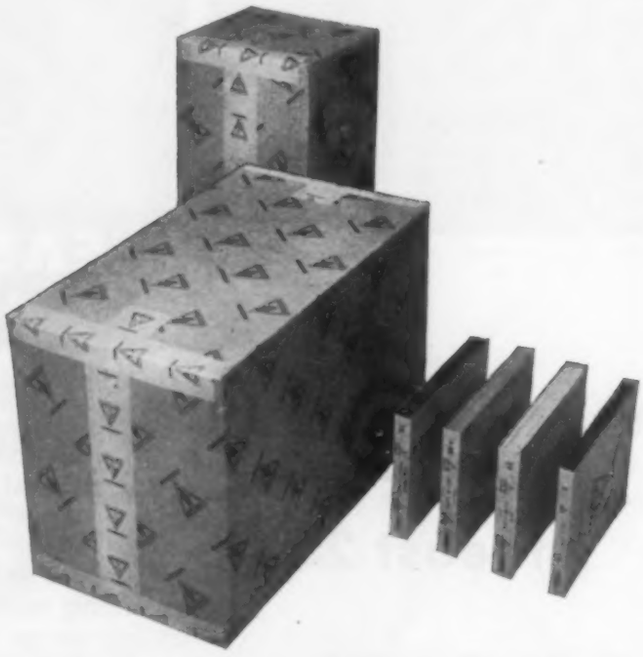
***A POLYVINYL CHLORIDE COMPOUND**

ATLAS PLASTIC SUPPLY CORPORATION
1007 NO. LA BREA AVE., (GLadstone 5161) HOLLYWOOD 38, CALIF.

BEHR-MANNING announces SERVICE PACKAGING

to its Distributors & Consumers

+



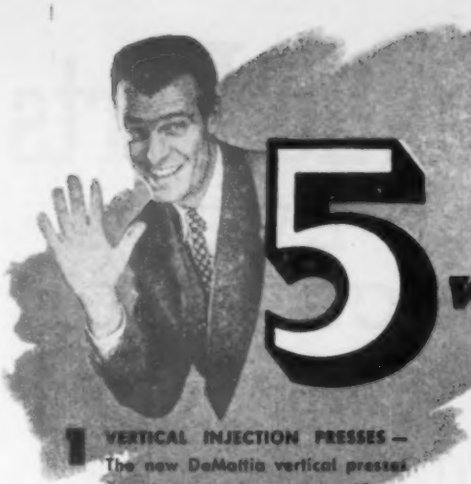
After two and one-half years of research into the packaging recommendations of our distributors, dealers and consumers, Behr-Manning announces the Service Packaging of Coated Abrasives, effective January first.

Service Packaging provides standard master packages, standard component resale packages, brand recognition by colored labels, and line identification by wrapper design. Thus, Service Packaging brings to distributors, dealers and consumers a new convenience and economy in the buying, selling, handling and use of coated abrasives.

Write for your copy of this 24 page Book

Here is the complete story of Service Packaging, simply told, with photographs of the new packages, full color labels and simplified charts showing package quantities by product, form and size.

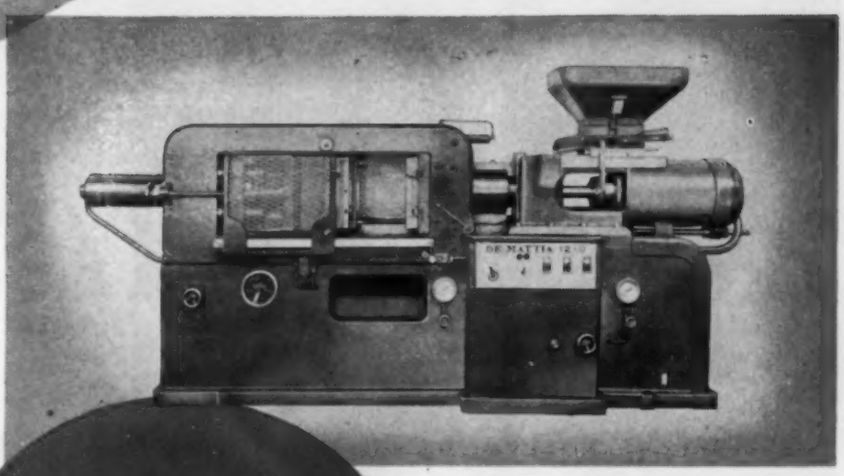
BEHR-MANNING · TROY, N. Y.

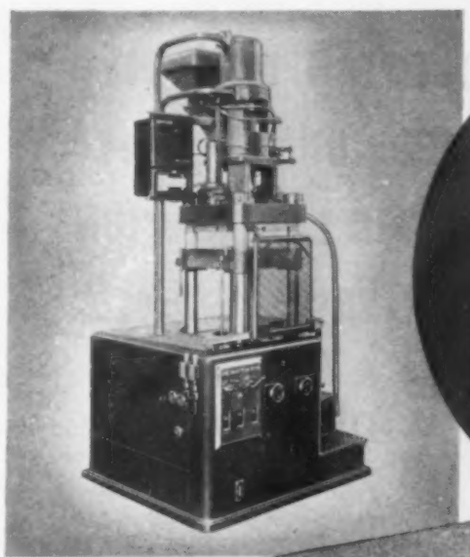


PACING MOLDING SINCE 1909 — DeMattia has been a leader in the molding industry from the very beginning. Many of the first rubber molds were made in this plant. Later, with the introduction of plastic compounds, this association grew and in 1935 DeMattia pioneered the first injection molding press. Today, DeMattia equipment is speeding production in molding plants throughout the world.

5 ways to better molding!

1 VERTICAL INJECTION PRESSES — The new DeMattia vertical presses are supplied in 4 oz. or 12 oz. capacities. All models are hydraulic and feature smooth, fluid power for mold clamping and injection strokes. With a few low cost, easily installed additions, these vertical presses can quickly be placed in service on compression and transfer molding.





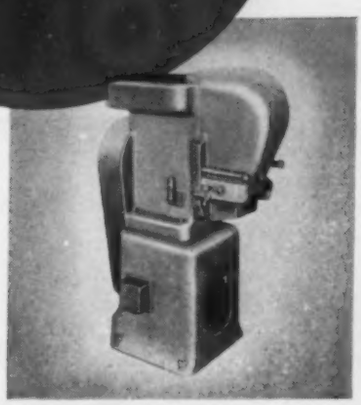
DE MATTIA PLANT EQUIPMENT

2 HORIZONTAL INJECTION PRESSES — These up-to-the-minute molding machines include every modern advantage known to the plastics industry. Models are available in 6 oz., 12 oz., or 24 oz. capacity. All are built with welded steel base, solid tension members and roll-action solid steel toggles.

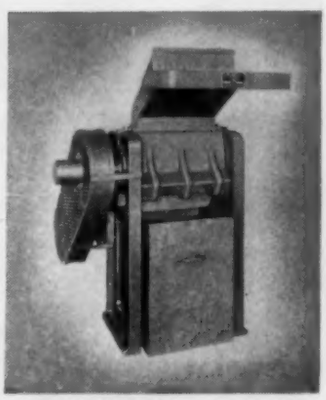
3 Mold Making

Your molds are designed and fabricated by experts who grew up in the industry. Your product—whether simple or intricate—will be engineered for maximum performance and consumer acceptance. DeMattia offers complete design facilities combined with skilled tool makers, assuring you precision built molds properly designed for low-cost, high quality production.

ILLUSTRATED LITERATURE AND SPECIFICATIONS SENT PROMPTLY ON REQUEST — WRITE TODAY



4 CHUNK CUTTERS — Use of this money-saver will make it possible for the molder to process most of his scrap in his own plant. This method saves scrap storage space, processing charges and valuable time. The Chunk Cutter accommodates all the large pieces removed in cleaning heating cylinders, nozzle accumulation and molded pieces too tough for the conventional sprue and scrap grinder.



5 GRANULATORS — Simply constructed with a minimum of parts, these rugged DE MATTIA scrap grinders have proven valuable additions to hundreds of molding plants everywhere. Working parts that contact plastic compounds can be thoroughly cleaned by hand wiping and the machine put in operation again in less than 3 minutes time. Cutting knives placed on a bias make this granulator especially suited for cutting of semi-rigid plastics such as Vinylite, etc.

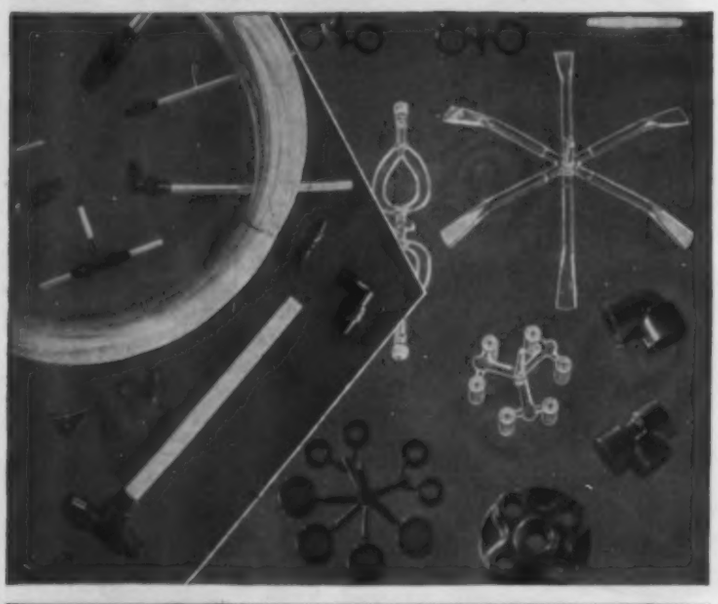
DE MATTIA MACHINE and TOOL CO.

CLIFTON, NEW JERSEY • N. Y. Sales Office: 50 Church St. • Cable Address: Bromach, N. Y.

DE MATTIA MACHINE and TOOL CO.

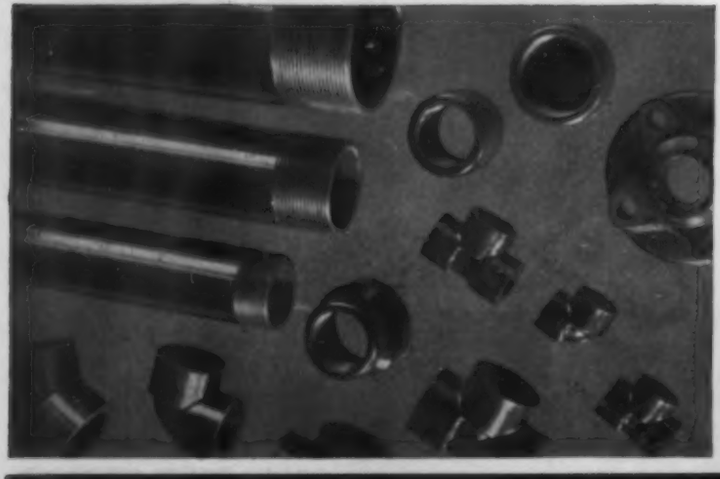
Plastic Parts
OF EVERY DESCRIPTION

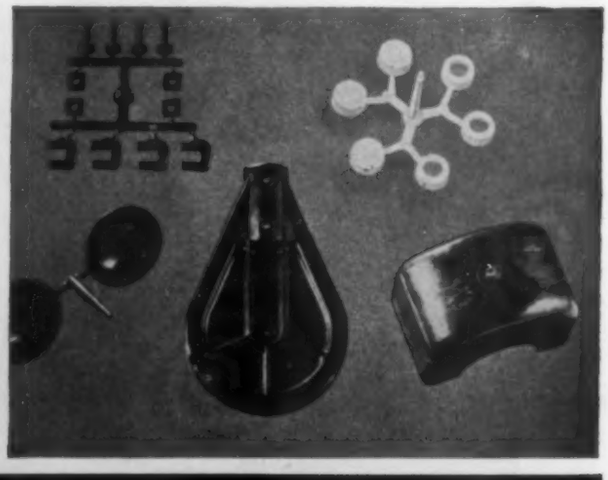
PLASTICS St. Louis



INJECTION MOULDING
EXTRUSION MOULDING
PLASTIC FABRICATION
ENGINEERING COUNSEL

Complete Mould and Tool Shop





ST. LOUIS PLASTIC MOULDING CO.

SAINT LOUIS 8, MISSOURI

1
2
3
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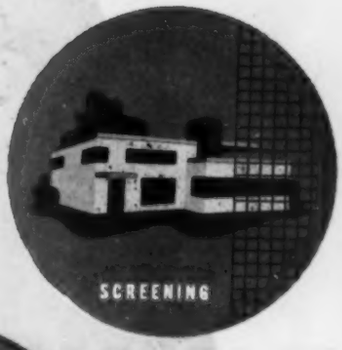


COUNT THE FORMS OF VELON*

A magic new material you can count on for beauty, for wear, for versatility. *Velon* resists staining, soiling, shrinking, fading, abrasion, water, acids, alkalis. The uses of *Velon* are countless.

1. **NEWER-THAN-LEATHER** . . . never scuffs, peels or cracks.
2. **FILM** . . . developed for your needs in almost any width, weight, gauge or color.
3. **FIBRE** . . . *Velon fibres* can be woven into fabrics of limitless designs.
4. **SCREENING** . . . lightweight *Velon* has high impact strength.

Firestone *Velon**

Write Firestone, Akron, for four-color VELON booklet

*TRADE MARK

all

THE FEATURES YOU WANT IN

BETHLEHEM HYDRAULIC PRESSES

If there are special features you want in your press, let Bethlehem work with you from the start. Every Bethlehem press is built to order—a special job—and our technical men can often help you plan your unit to best advantage.

From the Bethlehem shops come both large and small presses in hot-plate and other types. We furnish them with or without self-contained or separate hydraulic power systems—whichever you specify.

Get in touch with us when planning presses for plastics, wallboard, fiber board, vulcanizing, or metal-forming. We have the materials, the facilities, and the background to do a good job for you.

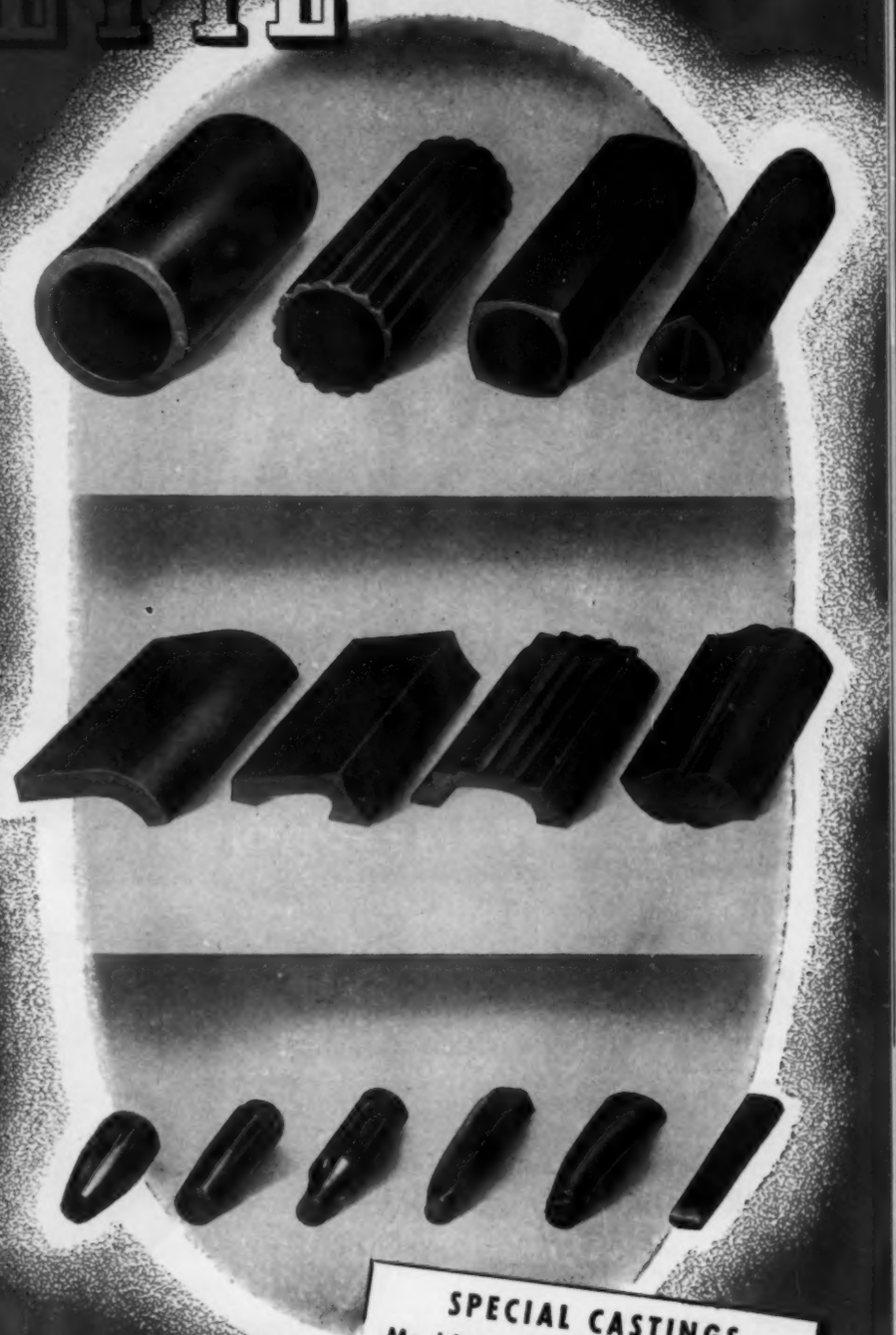
BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

A CAST PHENOLIC RESIN OF EXCEPTIONAL QUALITIES

MARBLETTE



Outstanding among plastics, Marblette has a jewel-like depth and a complete color range which duplicates the appearance of precious stones, tortoise shell and ivory.

Its almost infinite variety of colors is available in transparent, translucent, opaque, or in mottled effects. Marblette also comes in a water clear form known as "Crystle" in a wide choice of colors.

Marblette's machining characteristics, resistance to oils and acids, non-inflammability and exciting beauty make it ideal for countless manufacturing needs.

MARBLETTE will help plan your world of tomorrow. The Marblette staff of engineers offers its services to help with your manufacturing problems. Write to us outlining your needs.

SPECIAL CASTINGS

Marblette is supplied in sheets, rods, tubes, and special castings such as cutlery handles, kitchen utensil handles, pipe stems, cigarette holders, clock cases, automotive trimmings, jewelry items, buckles, etc. Special shapes made to customer's specifications can be supplied provided draft is all one way.

THE MARBLETTE CORPORATION

Manufacturers of Phenolic Resins since 1929

37-21 THIRTIETH ST., LONG ISLAND CITY 1, N. Y.

Making new records
for speed and economy

BALDWIN-SOUTHWARK

IMPROVED PRODUCTION

Chart shows savings which can be effected with Hy-Speed Plunger Molding.

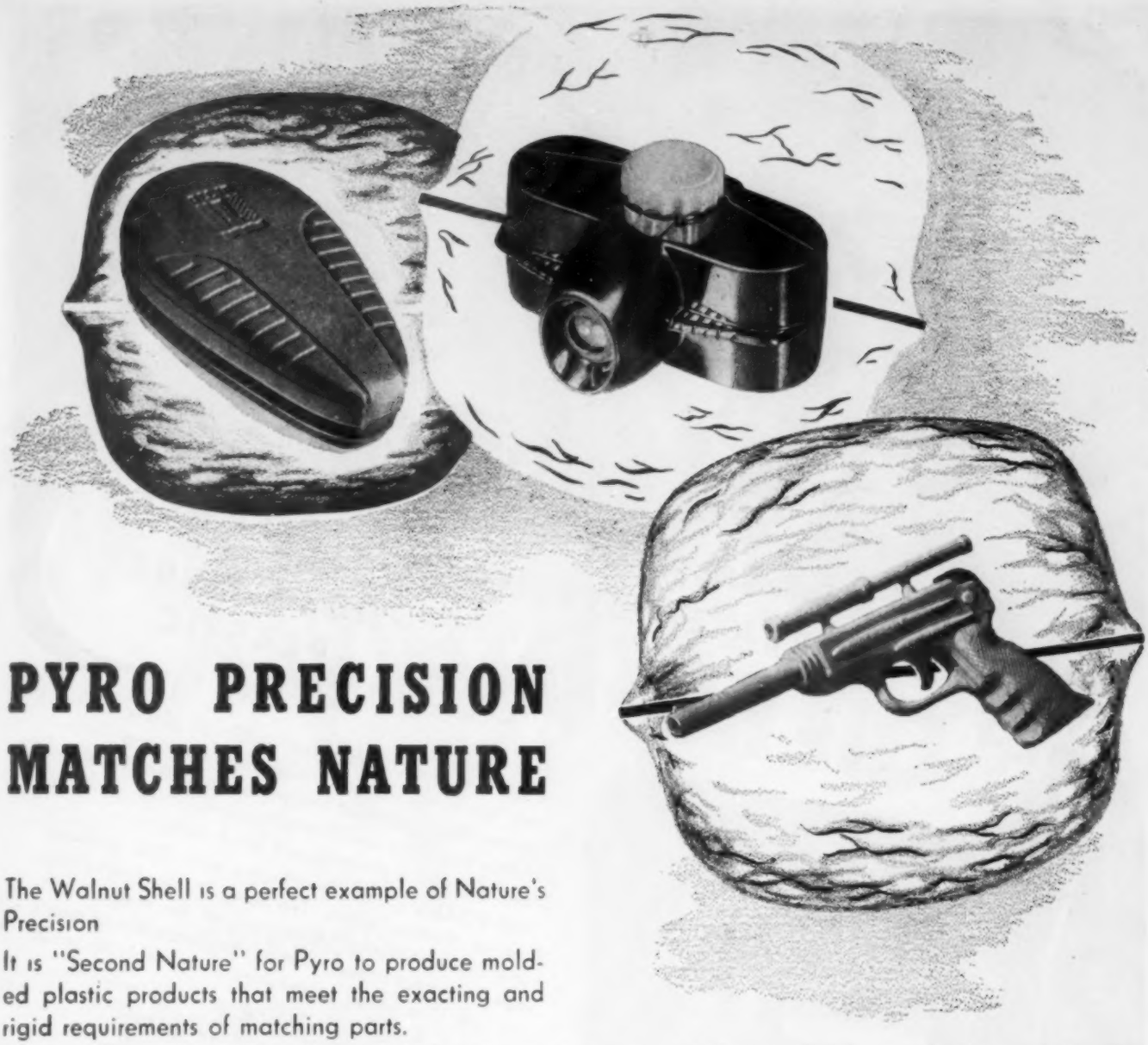
BETTER QUALITY

Product has greater density, lower porosity, greater uniformity, requires less finishing.

Standard models available from 50 tons to 300 tons. Ask for Bulletin 251.

BALDWIN
HYDRAULIC
MOLDING PRESSES

The Baldwin Locomotive Works, Philadelphia 42, Pa., U.S.A.
Offices: Philadelphia, New York, Boston, St Louis, Chicago, Birmingham, Houston, Cleveland, Detroit, San Francisco, Washington, Seattle, Pittsburgh.



PYRO PRECISION MATCHES NATURE

The Walnut Shell is a perfect example of Nature's Precision

It is "Second Nature" for Pyro to produce molded plastic products that meet the exacting and rigid requirements of matching parts.

The All-In-One shoe shine kit, molded for Plastics International Corporation, demanded a smooth, even contour with a delicate snap lock—Pyro molded it.

The 35 mm Camera Viewer, molded for Acme Plastic Toys, Inc. called for a knob and a positive sprocket contact for film winding action, together with a perfect press fit—Pyro molded it.

The Super-Site Telescope Gun, molded for 20th Century Products required many parts free from warpage and held to strict tolerances making for smooth mechanical action—Pyro molded it.

Whether it be a toy, a novelty, a household appliance, or an integral part to complicated industrial applications, you can be assured of the BEST in Design, Engineering, and Molding Technique.

At no charge or obligation, you may receive expert advice and an estimate of costs.

Simply state your problem or send prints—and be "In The Know" through "Pyro"

Pyro

PLASTICS CORPORATION

WESTFIELD, NEW JERSEY

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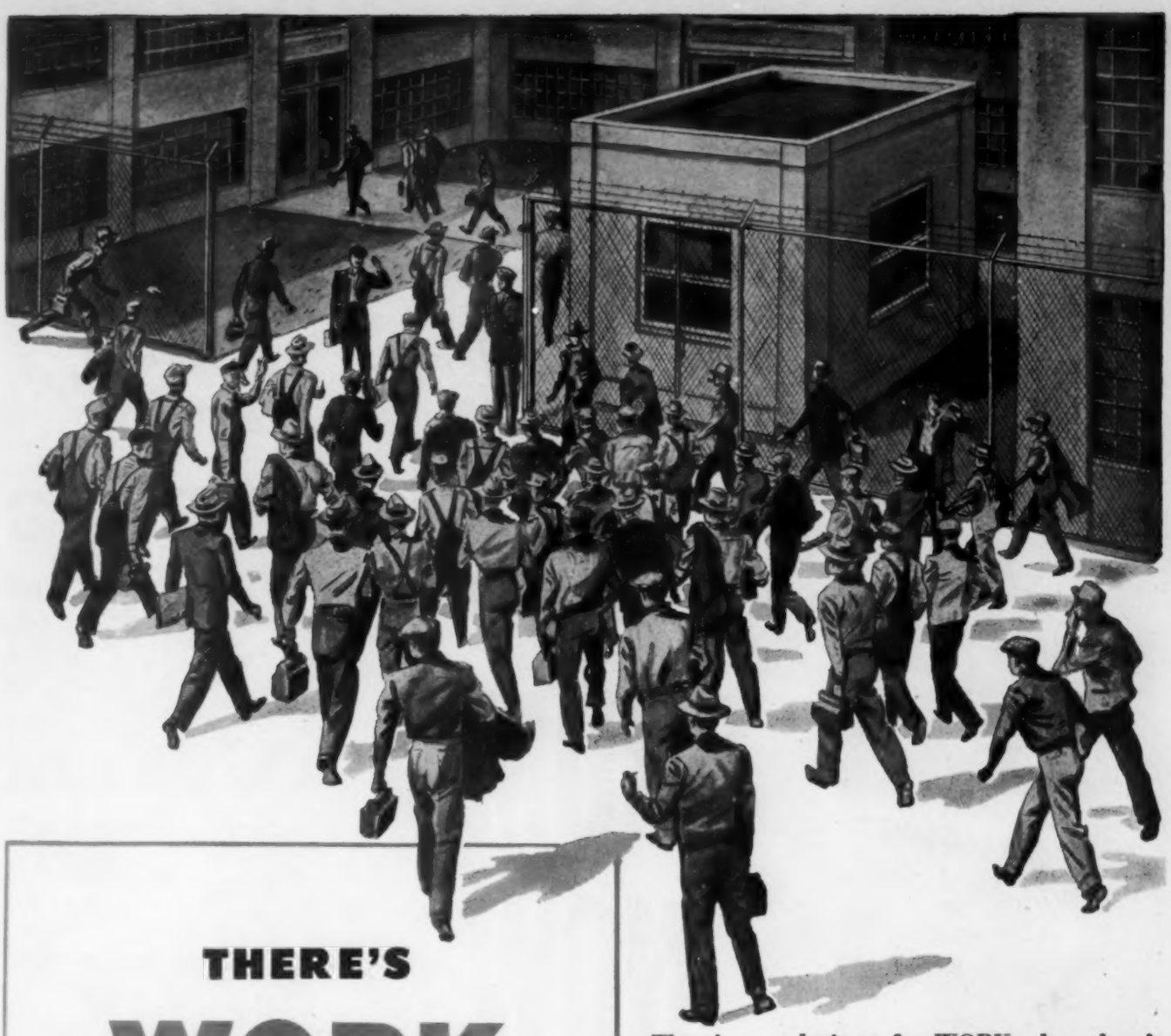

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VOLUME 25 OCTOBER 1947 NUMBER 2

ALL PHOTOS, COURTESY ENJAY CO., INC.

Addition of nitrile rubber to vinyl resins used for upholstery helps to prevent surface blooming at normal temperatures, improves the flexibility, reduces any danger of permanent set and of odor

Acrylonitrile moves into plastics

EVER SINCE the close of the war, there has been considerable watching and waiting for the petroleum industry to make known its activities in the field of plastics. There has been no little talk about petroleum-derived alcohols, plasticizers, solvents, benzol, cresol and cresylics, but no great drive to impress the plastics industry with what might be expected from the petroleum industry in the line of raw materials needed for synthetics. No doubt this hesitancy was caused by the inability of the oil industry to meet the demand for its basic products such as gasoline and fuel oil, as well as lack of time and certain chemicals needed to perfect its development work.

The curtain has now been partially raised by the Standard Oil Co. (N. J.) through Enjay Co., Inc., a subsidiary selling Jersey Standard's chemical products.

What promises to be its most important contribution to plastics is Perbunan rubber. Perbunan is one of the Buna-N type or nitrile rubbers. It is not exactly a new product, but its use in combination with plastics to form new and improved compounds is just beginning to get underway. Many of those who have been privileged to work with these combinations are convinced that the efficiency and usefulness of both plastics and rubber products will be tremendously enhanced, and that costs may be lowered when the two industries become familiar with and gain the necessary experience in fabricating these new combinations.

Up to date, Perbunan has been used primarily in plastics for combining with polyvinyl chloride and copolymer resins. It has also been combined with modified phenol-formaldehyde resins. Its importance when used with the vinyls is that it lessens the need for plasticizers. Smaller quantities of plasticizer are necessary,

and the Perbunan helps to prevent the loss of liquid plasticizers by surface blooming at normal temperature or vaporization at high temperature. Likewise, it helps to prevent cracking of vinyl films or sheeting at low temperature. In some cases, no liquid plasticizer is needed when vinyls and Perbunan are combined.

The mixture of Perbunan with phenolic resins is still developmental, but tool handles, hammer heads, dust pans, shoe soles and heels, telephone bases and other items have been produced with desirable qualities from this combination. Researchers claim that the combination of nitrile rubber with phenolics offers materials that combine some of the better qualities of both while eliminating some less desirable qualities.

The rubber industry is trying to drop the Buna label in all synthetic rubbers because they don't like the connotation of Germany ancestry, but in any discussion of the subject, it becomes a necessity of nomenclature to point out this historical fact for the benefit of readers who are interested in its derivation. During the war, Perbunan was used largely for fuel cells, hydraulic hose and similar applications and wherever there was a need for oil-resistant rubber that would stand up under heavy abrasion and temperature extremes. As a specialty rubber, it is now used for gasoline hose, particularly from truck to tank; for oil well service parts, such as molded pipe wipers and packings; for bushings for steam iron cords; for MicroSwitch seals.

Among other important uses for nitrile rubber and latices is their employment in paper coating to obtain special properties and as a base material for application of plastic surface coats. For this purpose it may be used either in solution or as a latex, and is already being shipped in tank car lots to converters.

With production of Perbunan for civilian economy and for use in plastics, the need arose for easier processing polymers to reduce mixing and fabricating costs. Perbunan 26 NS60 was developed to meet this demand. The extruded tubes shown below were prepared for fabricating into gasoline pump hose. Tube at left was made from Perbunan already familiar to industry. The tube on the right was prepared from the new easy-processing polymer. Smoothness of the tubes is an indication of the processing properties of the two polymers. The compound from which the smooth tube was made could be mixed in 25 percent less time and was also extruded into a smoother product in 25 percent less time

WARTIME POLYMER EASY-PROCESSING POLYMER

Nitrile rubber capacity

As synthetic rubbers go, the capacity for producing nitrile rubbers is limited at present. Wartime capacity was somewhere near 25,000 tons annually, but the best production year during that period brought forth only 17,000 tons. Other nitrile rubbers, aside from Perbunan, are Hycar by the Goodrich Chemical Co., Butaprene by Firestone Tire & Rubber Co. and Chemigum by Goodyear Tire & Rubber Co.

The particular difference between nitrile rubber and the more commonly used Buna-S or GR-S synthetic rubber is the use of acrylonitrile instead of styrene. GR-S is a composition which ordinarily contains 75 percent butadiene and 25 percent styrene. Perbunan and other nitrile rubbers contain butadiene and varying amounts of acrylonitrile. Nitrile rubbers contain from 18 to 40 percent acrylonitrile, depending upon the desired performance of the end product.

Acrylonitrile

It is this acrylonitrile that is presently intriguing the chemical, petroleum, rubber, plastics and textile industries; and we will digress here from Perbunan for a look at this utilitarian chemical which helps to give nitrile rubbers their unusual properties.

The first nitrile—propionitrile—was developed in 1834, but not much ever came of it. Another, known as lactonitrile, came forth in 1850 to help originate the synthesis of amino acids, the building blocks of proteins in food. Since then, nitriles have been identified as occurring naturally in bone, oil, coal tar, almond and peach kernels, and in sorghum. But none of these sources yield the commercial nitriles of today. All present nitriles are synthetic. Until the past 10 years, all nitriles remained largely laboratory curiosities.

The demand for acrylonitrile for rubber during the war brought it into commercial-scale production in 1940 and facilitated development of its derivatives. As a result, there are now available a great number of new compounds—long words ending with -nitrile that may soon compare in number with the -amides or -aldehydes. Their outstanding characteristic is their readiness to react with other chemicals to yield amides, acids, esters and amines. The nitriles are used in some form

TABLE I — PHYSICAL PROPERTIES OF THREE COMBINATIONS OF VYNW-PERBUNAN-DIOCTYL PHTHALATE COMPOUNDS

Ingredients	*Compound A Parts*	*Compound B Parts*	*Compound C Parts*
VYNW	100	100	100
Basic lead carbonate	3	3	3
Stearic acid	1.5	1.5	1.5
Dioctyl phthalate	50	25	25
Perbunan 35 NS 90	—	25	—
Perbunan 26 NS	—	—	25
PROPERTIES OF THE UNAGED COMPOUNDS			
Tensile strength, p.s.i.	3000	2920	2610
Ultimate elongation, percent	280	310	300
Durometer hardness	85	87	84
Brittle temperature, °F.†	−20	−40	−40
Crescent tear, lb. per in.	420	380	355
PROPERTIES OF THE AGED COMPOUNDS			
Change in weight of 0.075-in. thick sample after 7 days at 180° F. in 300- by 38-mm. test tubes, percent	−0.20	−0.15	−0.05
Change in weight of 0.020-in. film after 11 days in an air oven at 194° F., percent	−10	−2.5	
Volume increase after 7 days at 25° C. in:			
A.S.T.M. Fuel No. 2, percent	−8.6	+4.0	−11.2
A.S.T.M. Fuel No. 1, percent	+1.2	+0.3	−1.3
A.S.T.M. Oil No. 3, percent	−0.4	−0.4	+1.6
Water, percent	−0.2	−0.6	+0.2
Oven-aged for 70 hr. at 250° F.			
Tensile strength, p.s.i.	2910	2900	2520
Ultimate elongation, percent	150	140	150
Durometer hardness	89	87	89

†A.S.T.M. D746-44T.

for such diverse purposes as extracting oils from fish and fish livers, preparing waxes, preparing vitamins and penicillin, producing nylon, as lacquer solvents, as insect repellents—in fact, a whole host of uses. Three of the nitrile compounds—lactonitrile (a lacquer solvent), ethylene cyanohydrin and acrylonitrile—are now available in tonnage lots.

Acrylonitrile, the type with which we are most concerned, has many uses aside from its combination with butadiene to form synthetic rubber. Its application as an insecticide and its use in certain phases of flour mill fumigation are already recognized. As an intermediate chemical, its adaptability has been scarcely touched. A small amount of it (2 percent) in GR-S acts as a catalyst to speed up production. Dow Chemical Co. is using it as a copolymer with vinylidene chloride to form one of its new coating resins, F-120. The largest potential of all is as a component in a new synthetic yarn which has the warmth, appearance and feel of silk, resists water and moths, and can be woven on rayon equipment for hosiery and other garments.

Experts maintain that polymerized acrylonitrile is almost certain to become the foundation of a low-cost synthetic fiber with good resistance to heat, light, and chemicals, which may possibly undersell nylon in the hosiery market. They assert that these fibers have flexibility, resiliency, high tenacity and resist soiling. The fibers can be cleaned with common cleaning agents and do not shrink much when heated to high temperatures. There are scores of possible end products that can be manufactured from acrylonitrile multifilaments and monofilaments. Some of them are upholstery, velvets, carpeting and the pile or backing for such articles; fishing lines and fish nets; bathing suits; lightweight clothing for tropical climates; cordage and umbrellas. An industrial filter fabric of this type has already received acceptance. Screens that can be rolled up, bristles and rattan-like fabric are other possibilities.

Companies who have patents on these fibers are E. I. du Pont de Nemours & Co., Inc., with Fiber A; Carbide & Carbon Chemical Co., with Vinyon N, which is a copolymer of vinyl chloride and acrylonitrile; and the General Electric Co., with patents covering copolymers of acrylonitrile with itaconic esters and also acrylic esters. Among the three patents there is provision for almost every kind of strand, from yarn to rope, and fabrics from the finest silken texture to the coarsest canvas.

The wise reader will note, however, that practically

Nitrile rubber as it comes from the plant is somewhat similar to natural rubber in looks. Here finished rubber is being cut into uniform squares and stacked prior to weighing, and packing

all these developments are still in the experimental stage. There are many problems still to be overcome. For example, the material is difficult to dye, tough to process and in some cases has poor light stability. We record these activities in acrylonitrile here because our readers are concerned with the entire field of synthetics and, in a discussion of any new material, it is important to know the potential demand and what the supply is likely to be, from both a quantity and price-wise viewpoint. There may be a volume demand for acrylonitrile within the next few years, when the various industries concerned learn how to use it, and it may, therefore, go to a mass production basis. During the war it sold for 39 cents per lb., is now only 29½ cents. Though still higher than styrene monomer or butadiene, for example, increased production should lead to lower prices, as with styrene and butadiene.

The American Cyanamid Co., sole producers of acrylonitrile in this country, now have a production capacity of 13,200,000 lb. annually, but new facilities will bring that rate up to 27,000,000 lb. early in 1948. This is not a great quantity in comparison with some other raw materials; but acrylonitrile is a brand new competitor trying to force its way up an already crowded ladder. The producer reports that civilian demand in 1947 approached the 1944 demand when war uses for special applications took the entire output.

Other companies have shown interest, but as yet there are no announced plans for additional production. Rohm & Haas Co. produced about 6,000,000 lb. annually during the war but stopped production some time ago. E. I. du Pont de Nemours & Co., Inc., made somewhere around 200,000 lb. in 1942 but is not presently in the field. Both Phillips Petroleum Co. and Sinclair Oil Corp. are reported to have patents but show no signs of plans to enter the competition.

Lack of raw materials

One of the most important factors holding up production has been a lack of raw materials. Acrylonitrile is a combination of ethylene oxide and hydrogen cyanide (vinyl cyanide to the researchers).

Ethylene oxide is an interesting chemical in its own right, with exceptional properties as an intermediate for use with other chemicals to form detergents, wetting agents, mold inhibitors, and many other products. Ethylene oxide, produced by only two companies at present—Carbide & Carbon Chemicals Corp. and Dow Chemical Co.—is the bottleneck but one that will soon be broken. Carbide & Carbon Chemicals Corp. is going into increased production in its Texas City plant; Jefferson Chemical Co., jointly owned by American Cyanamid Co. and Texas Oil Co., will go into production within a few months, as will Wyandotte Chemicals Corp. of Wyandotte, Mich.

There are known to be other methods of making acrylonitrile. The Germans operated two different plants, but the one using ethylene oxide and hydrocyanic acid produced 85 percent of the total tonnage of acrylonitrile in that country.

Apparently, then, the bottlenecks for acrylonitrile production will soon be broken sufficiently to meet current demands, but if it comes up to expectations in plastics and textiles alone, there will be far greater need for it than any presently announced capacity.

The present suppliers however, have constantly anticipated demand. This was evidenced by their setting a production capacity of 7000 lb. per month in the early part of 1941, expecting a sizable increase in demand should this country enter the war. Industry can be reasonably assured that the present suppliers will continue to keep abreast of demand with sufficient raw material supply to meet any future demands.

Nitrile rubber's possibilities

The Standard Oil Co. (N. J.) is interested in nitrile rubber because of the company's capacity to produce butadiene for which it is seeking every possible outlet and because a long research program has convinced company officials of Perbunan's practical possibilities.

They believe that results already achieved indicate that mixtures of vinyl chloride copolymers and Perbunan will give the plastics industry a vinyl product that should leave little cause for worry over exudation when

exposed to high temperatures, cracking at low temperatures or odor. Furthermore, they feel that appearance, wearing quality and hand will be enhanced.

They do not look upon Perbunan entirely as a plasticizer but compare what it does, when used with vinyl, to the action which takes place when steel is improved by adding alloy elements such as molybdenum or tungsten. Perbunan does a job similar to that of the plasticizer but is incorporated in solid rather than in liquid form. When used with vinyl, it broadens the field of the end products. Vinyl drapes may possibly be hung near radiators, and vinyl upholstery be used on sports-model convertible cars with less chance of exposure to heat or sunlight making them sticky. Seats for engine cabs and upholstery used in bars or for dinette seats will be less likely to sweat or crack, because there will be less or, in some cases, no plasticizer to come out and leave the coating brittle.

Standard Oil Co. (N. J.) technicians are particularly proud of their ability to obtain a nitrile rubber with light stability. The secret of good color in rubber, just as it is in vinyl, is the stabilizer.

The stabilizer most commonly used for synthetic rubber is phenyl beta naphthylamine. It has not always been satisfactory for color work, so it has been necessary to use new and different stabilizers in order to make nitrile rubbers suitable for vinyl blending or other color work. Part of the modification of Perbunan was a change in stabilizer which, according to Enjay technicians, gave it remarkable color stability properties. In addition to this special stabilizer which is incorporated in the Perbunan, Enjay has recently introduced another stabilizer or antioxidant called Deenax which can be used as auxiliary stabilizer when nitrile rubbers and vinyl resins are blended. Vinyl portion of the blends is also stabilized with lead carbonate or other suitable materials.

Best proportion

Various percentages of Perbunan are used with vinyl as indicated before, but the most satisfactory range is from 25 to 50 parts with 100 parts of vinyl resin. If less than 25 parts are used, the effectiveness of the Perbunan is lost. The best proportion to use for preventing exudation of plasticizer seems to be about 50 parts Perbunan. A straight blend of nitrile rubber without liquid plasticizer is difficult to process, but it can be done although considerable development work is still needed to perfect the process.

Tests giving evidence of the Perbunan-vinyl blend's high and low temperature performance constitute the outstanding appeal of this material to the processors. Tests by Standard Oil Co. (N. J.) show that a vinyl copolymer resin plasticized with 46 parts of dioctyl phthalate to 100 parts resin will break at −30° F. But a compound of 100 parts vinyl, 25 parts Perbunan and 25 DOP will go to −50° F. before breaking. The company believes that the addition of Perbunan to a vinyl compound with plasticizer will generally reduce the cold cracking point by 30° F.

The improvement at high temperatures is even more pronounced from a practical point of view. After 168 hr. of heating at 180° F., a compound containing 100 parts of VYNW and 50 parts DOP, the material showed 0.20 percent weight loss. A compound containing 100 parts VYNW, 25 parts DOP and 25 parts Perbunan showed only 0.05 percent loss, indicating that almost none of the plasticizer had been lost.

This ability to withstand higher heat and lower frigidity without loss of plasticizer isn't the only property that Perbunan adds to vinyl chloride products, say its developers. They assert that it gives a more leather-like feel to artificial leather upholstery, and improves flex life to such an extent that it will outwear leather even more so than straight liquid plasticized vinyls; that it improves the finish of patent plastic and increases the tear resistance of unsupported film. In addition, they point out that being more flexible, it is less likely to show permanent set when used for upholstery, that it feels warmer to the touch than totally liquid plasticized vinyls and has less odor. Pocketbook sheeting containing 50 percent DOP has been produced, they say, which gave no evidence of plasticizer migration when it contained Perbunan.

Another prospective market is for shoe uppers. Perbunan-containing vinyl material can be attached to the sole without adhesive problems since most adhesives will adhere to rubber but not so readily to vinyls. Still other advantages added by Perbunan are improved surface life of tubing when exposed to oil, higher loading to give less costly compounds, improved elongation and greater resiliency.

Processed on standard equipment

Perbunan-vinyl compounds may be processed on equipment generally used in the rubber and plastic

Table 2 — Roof exposure of five vinyl-perbunan compounds

(BASE RECIPE: VYNW 100, basic lead carbonate 3, stearic acid 1.5, plasticizer as indicated.)

Plasticizer	*1*	*2*	*3*	*4*	*5*
Perbunan 26 NS	—	25	—	—	25
Perbunan 35 NS 90	—	—	25	—	—
Dioctyl phthalate	50	50	50	—	—
Tricresyl phosphate	—	—	—	50	50
Properties of the unaged compounds					
Tensile strength, p.s.i.	3000	1290	2380	3460	2480
Ultimate elongation, percent	280	360	370	220	320
Durometer hardness	85	68	72	95	74
Color	colorless	very light yellow	very light yellow	colorless	light yellow
Properties of the compounds, roof-aged for six months					
Tensile strength, p.s.i.	1550	1950	2740	2690	1490
Ultimate elongation, percent	200	200	220	100	100
Durometer hardness	85	75	85	80	85
Color	black	very light yellow	very light yellow	black	light yellow

industries. The resin, stabilizers, lubricants, fillers and liquid plasticizers are blended by hand or in a kneader. These are added to a rubber mill which is maintained at 270 to 300° F. The resin is fluxed and milling is continued for 4 or 5 min., with occasional cutting to improve dispersion. The Perbunan is then added to the mill and milled with cutting for approximately 10 minutes. Blends which do not contain a liquid plasticizer can be mill mixed, but the operation is more difficult. A Banbury mixer may be used if available or when larger quantities are desired.

When Perbunan-vinyl blends are extruded, the rubber increases the extrusion rate of the vinyl. The optimum range of concentration is generally between 12.5 and 50 parts of Perbunan to 100 parts of vinyl resin, with the liquid plasticizer varying between 25 and 50 parts. If the Perbunan content is over 50 parts with 50 parts of plasticizer, rough extrusion will result. At extruding temperatures, compounds containing nitrile rubber are less thermoplastic than vinyl resin containing only a liquid plasticizer, and there is less tendency for the extruded articles to change shape or collapse after leaving the extruder die.

When calendering Perbunan-vinyl compounds, it is advisable to add liquid plasticizers. Up to 50 parts of Perbunan may be used with liquid plasticizers, such as Paraplex G-25 and oleate types, but only 20 parts with DOP or tricresyl phosphate. Calender temperatures should be from 260 to 280° F., depending upon the type of resin, amount of Perbunan and type of liquid plasticizer. The following roll temperatures are recommended: top roll, 290 to 300° F.; middle roll, 270 to 280° F.; bottom roll, cold.

Blended Perbunan-vinyl compounds can be compression molded and press polished. Experience indicates that it is not necessary to chill the mold prior to removal of the product. The Perbunan appears to modify the thermoplastic characteristics of vinyl resin compounds so that they have more strength at molding temperatures than does vinyl plasticized with liquid plasticizers. Compounds of Perbunan in concentration of 25 parts in a Vinylite VYNW compound containing 50 parts DOP have been successfully removed from a hot mold operating at 287° F. with 40 p.s.i. The ability to remove articles from the mold without cooling means increased production. Behavior in compression molding indicates it may be injection molded.

The presence of Perbunan in vinyl resin (vinyl chloride-acetate copolymer VYNS) reduces the moisture vapor penetration as illustrated by the following data:

VYNS	100	100
Basic lead carbonate	3	3
Stearic acid	1.5	1.5
Dioctyl phthalate	50.0	...
Perbunan 35 NS 90	...	50
Moisture vapor penetration	18	7

(The values shown are in terms of grams of water per 100 sq. in., per 24 hours.)

This represents a lower rate of vapor transmission than is obtainable with ester-plasticized vinyl. This property, combined with the low extractability and non-toxic character of Perbunan make these blends applicable for food packaging, particularly for oily materials such as oleomargerine and bacon. Developers claim it is possible to extrude or cast a very thin film suitable for packaging by using this combination compound without adding a plasticizer.

With phenolics

The use of Perbunan with phenolics is still in the developmental stage although such things as bonding cements for metal, glass, rayon; high pressure oil seals; tool handles for linemen working on high voltage wires have been produced from the combined compound. Most of the processing has been done by rubber compounders. Plainly speaking, the modified phenolic has been added to nitrile rubber in order to impart high hardness and toughness. A phenolic molding powder using nitrile rubber as an additive to improve its qualities is still far from perfection, according to resin producers, although it is known that a phenolic molded telephone base containing 15 percent nitrile rubber has been produced experimentally with the thought that it would improve impact strength, while retaining good flexural strength and water resistance. However, a producer has stated that any such resin would cost perhaps three times as much as an ordinary phenolic compound, and problems of producing have by no means been completely solved.

Durez Plastics & Chemicals, Inc., is one company that has done considerable development work combining phenolics with Perbunan and other nitrile rubbers. Their resins, of which 12687 is mentioned as the most generally useful and effective, are described as completely compatible with nitrile rubbers. Owing to chemical reactivity, they contribute strongly to the vulcanization, reinforcement, hardness, stiffness, abrasion resistance, and heat and chemical resistance. Even though supplied in powdered or lump form, or melting at processing temperatures, these resins serve as thermosetting plasticizers—i.e., they soften or plasticize the stock during processing and contribute to the physical properties of the final cured stock. The above properties apply to those formulations involving 50 parts or less of resin to 100 parts of nitrile rubber. In such formulations the amount of sulfur, accelerators and reinforcing fillers normally used can be reduced because of the effectiveness of the resins. In higher resin-content formulations such as 100 parts of resin or more to 100 parts of nitrile rubber, all sulfur and accelerators are eliminated, but fillers may be used to increase strength and reduce costs. By using from 100 to 250 parts of resin to 100 parts of nitrile rubber along with 100 parts or more of fillers such as wood flour, walnut shell flour, clay, carbon black, etc., an excellent molding material results. Such compounds have properties equivalent to ebonite grades and can be cured at 320 to 350° F. in 5 to 10 min. as compared to 30 to 60 min. or longer for the high sulfur ebonites.

Above—A 10-part vinyl pump, an acrylic protective cover, a urea cap and a polystyrene bottle make a unique nasal medicine container

Below—An acrylic cover keeps the nosepiece clean and a swivel arrangement at the bottom of the pump makes it possible to use the last drop of medicine

Undercut bottle made of blown polystyrene

OPENING UP interesting possibilities for extended use of plastics in packaging is the polystyrene bottle of the Jetomizer, a container and applicator for nasal medication, developed by the Calmar Co., 7412 S. Broadway, Los Angeles 3, Calif., for the Jetomizer Co. Production of undercut bottles at a reasonable price has always been a problem to manufacturers. This serviceable little container may be the answer.

Interesting, too, is the Jetomizer's combination of plastic materials: urea, acrylic and vinyl. Main pump mechanism has four plastic parts: piston, cylinder, collar and head. Vinylite was chosen as the material for these parts because of its dimensional stability, its resistance to wear and abrasion, its non-toxic qualities. The fact that it is inert to most common solvents was still another reason for its selection.

Tolerance of 0.0005 in.

These four vinyl parts are molded in a 96-cavity stripper plate die. The stripper plate automatically shears all gates, which are located on the inside diameter of the molding. In case of trouble with an insert or molding, the operator can turn the insert in the die, thus shutting the gate.

Precision was necessary in the construction of the die because the working parts of the pump mechanism have a clearance of but 0.0005 in. with the piston lining in the cylinder.

A similar 50-cavity die was built to produce the rigid vinyl nozzle and several small parts for the swivel, a device which allows the last drop to be pumped from the container and eliminates waste. A 0.10-in. hole is molded into the nozzle.

Acrylic for cover, polystyrene for bottle

Protective covers for the nasal headpieces are molded of Lucite in an 8-cavity die. The polystyrene bottles which contain the medication are blow-molded by the Owens-Illinois Glass Co. The urea bottle caps are furnished by the Owens-Illinois Pacific Co.

The only non-plastic parts in the entire assembly are a stainless steel ball and two stainless steel springs in the pump mechanism.

The original suggestion for the Jetomizer came from an eye, ear, nose and throat specialist who saw the need for a device which would safely and efficiently send the jet of liquid medication into the upper nasal passages so as to reach the sinuses.

COLOR PLATE, COURTESY PARKER PEN CO.

Gold trim highlights black cast phenolic in this desk set. New base designs using a ball and an Alnico magnet make possible these simple lines

Acrylic sets gain three-dimensional effect by being finished on under side with metallescent lacquers

PLASTICS GIVE

THE MAGNETIX desk set with the Parker "51" pen looks attractively simple. But behind it are two years of painstaking research in plastics fabrication, market development and consumer preference as it relates to style and material. Its development involved a new formulation of cast phenolic, new dyes and new adhesives.

One sector of the research, which investigated the preferences of buyers, dealers, sales people and customers, was conducted by designers Robert Gruen Associates, the late L. Maholy-Nagy and Laurier Carriere.

Two plastics for bases, two fabricators

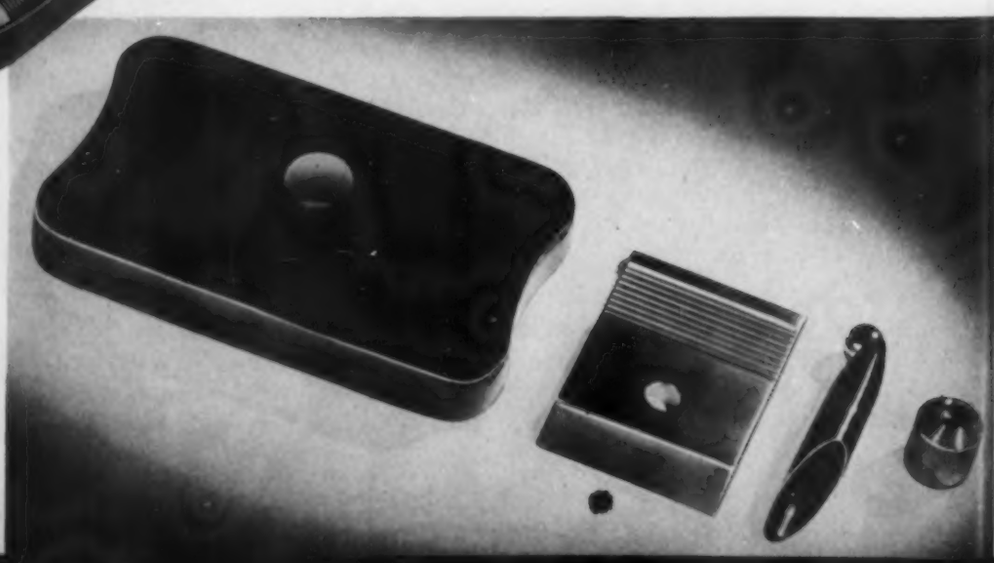
They found an opportunity for plastics—in this case acrylic and cast phenolic—because of color qualities, good finish and feel, and because of their ability to combine with other materials in handsome effects.

The new base designs, using Parker's patented ball and Alnico magnet, eliminate all the fancy gadgets, coils and springs needed in the old-type base and make possible the use of simple lines.

The magnet has a small semi-spherical cap indentation in the top in which fits the steel ball carrying the pen retainer, the ball rotating throughout 360°. Where the magnet comes up to the surface of the stand to catch the retainer ball, materials formerly used in the bases required capping with a metal disk or plate. But with fabricated cast plastics and acrylics, a feather edge is possible, giving the ball retainer the appearance of floating on top of the plastic.

Two fabricators were involved: Creative Plastics Corp., 963 Kent Ave., Brooklyn, N. Y., for the Catalin bases and Kent Plastics Corp., 1528 Fulton Ave., Evansville, Ind., for the acrylic. Both materials achieve a mirror finish as closely comparable in quality to stone or glass as possible while still retaining maximum surface hardness.

Catalin Corp. of America developed a special new



The set is here shown disassembled: phenolic base, gold-color trim, retainer of cellulose acetate butyrate with ball, and magnet

DESK SETS COLOR, FINISH, FEEL

resin offering the desired dimensional stability. Special dyes were selected after exhaustive tests to determine the greatest degree of lightfastness. Cure cycles were closely controlled. In fabrication, a coolant is used throughout by Creative Plastics Corp.

Where the castings are in single unit, all cutting is done with abrasive cut-off wheel under water. All surfaces then pass through at least three wet-sanding operations to remove taper in the casting. The operator then determines the best surface and brings the thickness down to a close tolerance, since most of the sets involve accurate matching with metal ornaments. A final pass is then made on a 500-grit belt and the base is ready for polishing. Extreme care is taken throughout to avoid flow marks. After this follows the lightest possible polishing with a minimum of ashing.

The feathering of the magnet holes to Parker specifications to enable the magnet to seat itself just 0.002 in. below the surface, involved considerable research before proceeding with manufacture. Polarized light tests on clear samples indicated that very reduced speeds in drilling and reaming under coolant were required to prevent strains and thus to keep the number of rejects at a minimum.

Cementing creates a problem

The Parker Pen Co. cements the magnet in place, applying felt covering to the bottom which is left unpolished to facilitate this operation. Considerable study was done at the Parker laboratories to secure a good cement which would hold the magnet in place on the inside, the felt bit on the bottom and securely adhere the metal ornaments. In the case of both the Catalin and the acrylic materials, consideration had to be given to the shrinkage factors and to the danger of various cements which might attack either the metal or the plastic.

For cementing the magnet to the base either EC-104, made by Minnesota Mining and Mfg. Co., 411 Piquette Ave., Detroit, Mich., or BC-17613 cement made by Bakelite Corp., Bound Brook, N. J., are used. The EC-104 cement is used for cementing ornaments to bases, while the felts are applied by means of Casco NT-513 cement made by Casein Co. of America, Bainbridge, N. Y.

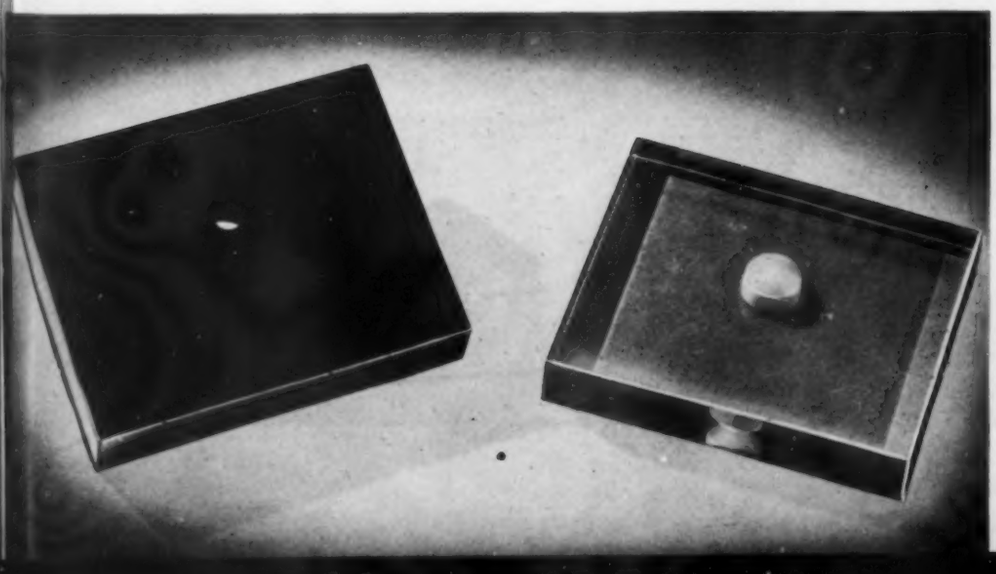
It was decided that gold anodized aluminum trim for engraving plates and pencil grooves would be most attractive with the black, burgundy and gray shades. The three-dimensional acrylic set, finished on the reverse side with special metallescent lacquers, uses a silver-plated, pressure-cast aluminum base.

Acrylic pen and butyrate holder

The Parker "51" pen itself is also largely plastic. After much study, Lucite was selected since it alone seemed suitable for permanent use with the specially formulated dry-writing Parker "51" ink. The company cuts these barrels from centerless colored Lucite sheet stock, grinding it into shape. Lucite is also used in some of the extremely accurate interior parts such as the collar, which is held to a tolerance of plus or minus 0.001 of an inch. The mechanism, point and shell are identical in quality with the pocket pen.

The retainer in the Magnetix desk set is so designed that it seals the pen as completely as a cap does on a pocket model. The retainer is injection molded from Tenite II by Minnesota Plastics Corp., 366 Wacouta St., St. Paul 1, Minn. The molded retainers arrive at the Parker Pen plant completely polished and attached by means of interior screws to plated steel balls. These fit into the cup receptacles of the Alnico magnets inserted in the bases.

The Parker "51" and its base represent a good application because designer and manufacturer turned to plastics after serious research. They had a series of problems and they found some of the answers, at least, in plastics.



Feather edges required reduced drilling speed and reaming under coolant, but that technique made possible the pocket for the retainer which is held securely by the magnet but allowed to swivel freely

Phenolics, not rivets, bond brake linings

A NEW PHENOLIC resin adhesive is the latest solution to the problem of bonding automobile brake linings to metal brake shoes without the use of rivets. The actual cementing of linings to shoes is in itself not new, but it has had numerous drawbacks and consequently, has not been universally or even nationally adopted.

The use that the Permafuse Corp., 153 Pierpont St., Brooklyn, N. Y., has made of a special Durez phenolic resin has, however, resulted in a bonding material for brake linings which has the following advantages to car owners:

1. The elimination of rivets allows the use of linings down to drum without danger of scoring drum.
2. The rate of lining wear is reduced through improved heat dissipation. There are no counter-bores (for rivet heads) to collect grit and dirt which also cause drum scoring. The elimination of such counterbores adds almost 10 percent more wearing surface to the lining.
3. The added strength of rivetless lining (said to be almost twice that of riveted lining) offers an additional safety factor.

Must withstand extreme conditions

The problem of developing a satisfactory adhesive was complicated by the extreme conditions to which automobile brakes are subjected in the course of normal use. The bonding agent had to be able to withstand extreme heat, excessive cold, high and low humidity, water, as well as cold and hot grease, cold and hot oil.

A further complication derived from the fact that the adhesive had to bond linings containing a composition of various ingredients to metal shoes which might be of various alloys. In addition, the method of application had to be simple and economical.

Available in tape form

The new bonding material consists of a specially prepared strip of tape impregnated with phenolic resin. Rolls of tape are available in widths to match the standard widths of brake linings. Strips of any desired length can be cut at the time of application.

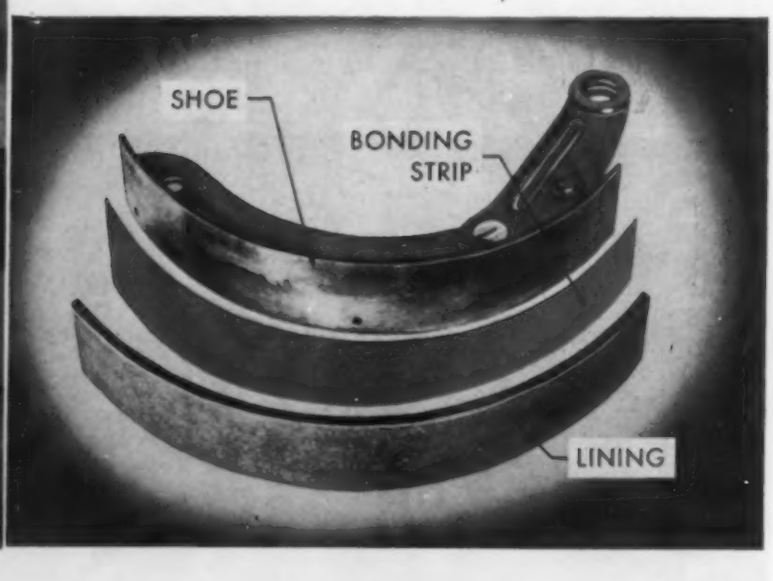
In the bonding operation, the lining, the Permafuse tape and two brake shoes are clamped together within flexible steel bands with hand spreader jacks. These jacks exert the required pressure. Then four such assemblies (one for each wheel of the car) are placed one atop another on a shoe carrier and inserted in an oven for 30 minutes. Under the proper heat the thermosetting resin forms an insoluble and infusible bond between lining and shoe.

Special service kit

Permafuse has designed a special oven and service kit to go with its new tape. The kit includes two sets of steel bands for four pairs of brake shoes and two sets of spreader jacks. The extra set enables operators to prepare a second set of brakes for the oven while one set is baking.

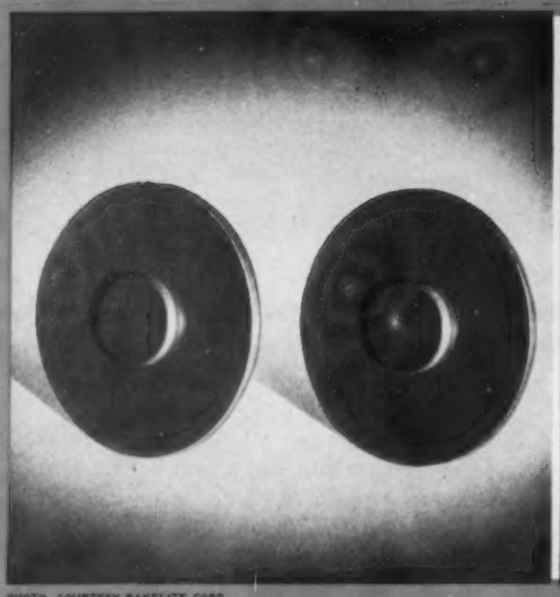
PHOTOS, COURTESY DUREZ PLASTICS & CHEMICALS, INC.

Left, strips of the tape can easily be cut to the desired lengths. Below, the position of the phenolic resin adhesive tape between the brake lining and brake shoe can be seen



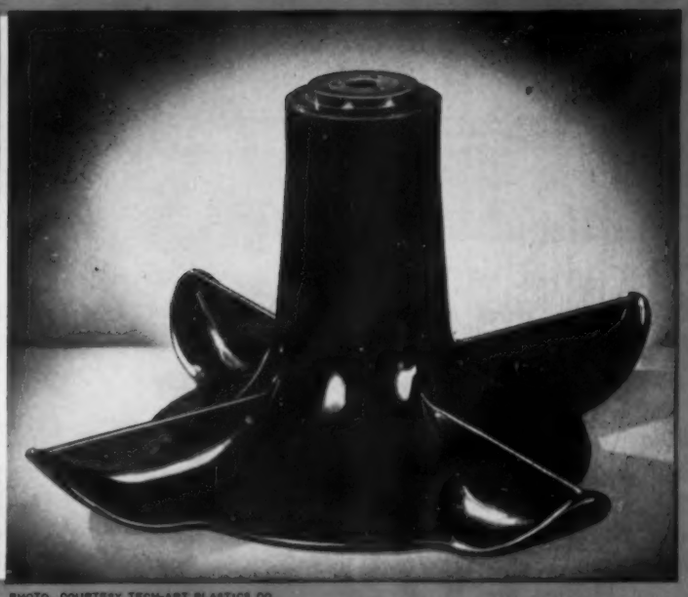
HOW BIG CAN MOLDED PIECES BE?

Development of new compression molding compounds requiring only low pressure should result in much larger molded parts



PHOTO, COURTESY BAKELITE CORP.

Compression molding started with 1-in. phenolic disks molded by Dr. Baekeland in 1909



PHOTO, COURTESY TECH-ART PLASTICS CO.

Far cry from Dr. Baekeland's disks is this 11-lb. dry-cleaning machine agitator. Mold weighs a ton

IN 37 YEARS the compression molding industry has grown greatly in numbers and resources. Its products too, have grown in size and possibilities. To measure that growth and gage the potential of the industry, MODERN PLASTICS magazine surveyed the field of heavy thermosetting compression molding, examining products and methods, talking to its leaders, facing its problems.

The findings indicated that the industry had reached a broad plateau. It received a good start in 1909 when Dr. Leo Baekeland produced a casting resin based on phenol-formaldehyde. One year later he combined that resin with a woodflour filler and molded a disk, approximately 1 in. in diameter and $^1/_4$ in. thick, for the Weston Co. The original single-cavity mold for that first thermosetting, compression molded part is still used for limited production. And the original Weston design is still satisfactory for its application in a meter.

Today pieces weighing 11 lb. are produced from standard thermosetting molding materials. But these parts, though a far cry from Baekeland's disks, are scarcely new developments; they have been molded for years. Whether there are new heights beyond this plateau on which the industry finds itself is a question which drew varied answers from the industry.

Current production is interesting and varied. There are over 400 compression molders making parts from phenolic, urea, melamine and other thermosetting compounds. Scores of different formulations have been developed, each adapted to its own particular application. The variation has been generally accomplished by the use of different fillers. If high impact strength is required, chopped canvas or string will do the trick. Mica will impart high dielectric properties while asbestos will raise the temperature resistance of the material. Of great significance has been the development of fast-curing resins which make possible the production of relatively thin section parts with cure times as low as 30 seconds.

Nowhere, however, are evident the oft predicted plastic houses and one-piece automobile bodies. Typical of such predictions is the one made only recently by Walter Dorwin Teague.* Mr. Teague writes: ". . . unquestionably plastics will supersede metals, wood and porcelain in many applications. We

* "Land of Plenty," by Walter Dorwin Teague, published by Harcourt Brace & Co., 1947.

PHOTO, COURTESY MICHIGAN MOLDED PLASTICS, INC.

"It boils down solely to the matter of the value of the finished part to the customer. Theoretically even if it took a day to cure a part, it would make no difference to the molder as long as the part had sufficient value to the customer to justify its cost. Our company looks at it from the standpoint of press hours and we feel that there will be more and larger parts as techniques improve. For example, the long press cycle on some of the oil well parts we have sent you (approximately 1/2 hr. cure) is necessary because some sections are as thick as 2 in."

John Rossiter, president of Michigan Molded Plastics, Inc.

These phenolic parts are used to seal joints in oil well casings. Walls are 2 in. thick, and parts need 1/2-hr. cure. When properly placed they must withstand concrete forced through them at 1200 to 1500 p.s.i.

shall have plastic automobile bodies lighter but tougher than steel, dent-proof and scratch-proof. We shall have plastic bathtubs, warm to the touch and light enough for the plumber's helper to carry in one hand; and plastic sinks and transparent plumbing pipes. All kinds of kitchen and laundry equipment and household appliances will be molded. . . . Extruded plastic sections will replace wood in the trim of our houses, and eventually our entire prefabricated house will be made of molded plastic panels—fireproof, termite-proof and with a lower coefficient of heat transmission than any building material now in use; while our windows will be glazed with transparent plastic sheets which admit all health giving actinic rays of sun as glass does not."

As conditions are today, and as it appears they will be in the foreseeable future, Mr. Teague's statements seem over-optimistic. However, there are in the industry today applications and processes that were labeled "impossible" a few years ago. And what has happened before can happen again.

Radio cabinets, toilet seats, washing machine agitators, large electrical housings and fuse box covers have been produced for some time, but though Mr. Henry Ford wielded his axe at the compression-molded rear deck of a Ford several years ago and proved that it could take it, no similar part has been produced on a commercial basis.

Survey methods

The purpose of the MODERN PLASTICS survey was twofold: to ascertain whether or not the compression industry had reached the maximum in the size and weight of its moldings; and if so, to draw conclusions and make recommendations pointing toward a resumption of the industry's advance.

Each molder of large parts was asked to submit not only his general comments, but a sample of his work together with statistics on the total weight of the part, approximate cost of the mold, estimated weight of the mold, size of the press and total time for each shot.

When the weights of the pieces were tabulated along with the total cycle, some correlation was noted, but the controlling factor was not the weight but the wall thickness of the part. For example, one 11-lb. piece required 1 hr. to cure, the same length of time needed for a 4-lb. piece. On the other hand another 11-

Melamine was used to mold this 18-cylinder distributor head in a single-cavity mold on 300-ton press

PHOTO, COURTESY KURZ-KASCH, INC.

PHOTO, COURTESY CHICAGO MOLDED PRODUCTS CORP.

This 21-in. wheel, which weighs 8 lb., is molded on a 750-ton press at the rate of 7 shots per hour

lb. piece took only 6 min. to cure, solely because its wall section was comparatively thin.

Curing time and original mold cost are undeniably important factors in the total cost of a piece. Yet no correlation between original mold cost and weight of the piece could be charted because a large, heavy but simple piece requires a less expensive mold than does a small but very intricate part. For example, an 11-lb. agitator for a dry cleaning machine required a $4000 mold, but a radio cabinet made by the same company and weighing 6.2 lb. needed a mold costing $11,000. A highchair tray weighing approximately 1.8 lb. required a mold that costs exactly the same as that for the 11-lb. agitator.

Since no reasonable correlation can be drawn involving the weight of the molded part, mold cost, cure time and actual cost of the molded piece, each molded job must be studied separately.

Where to?

Just as statistics on the large molded pieces produced by the industry gave no precise answer that might guide the industry to the "how" of bigger and better parts, so the comments of molders varied widely in their implication as to the direction in which the industry was moving. Would molded pieces grow in size and quality, or had we reached the peak? For any kind of an answer it was necessary first to discover what unsolved problems were keeping the molders from increasing the size and weight of their products above the level attained some years ago.

A few men in the industry were unreservedly optimistic. Such was Mr. George S. Laaf of the Bolta Co. who told us:

> "We visualize a trend toward larger pieces and do not believe that the upper level, as far as size and weight are concerned, has been reached, due to economical limitation of molds, presses, processing time, etc. The trend toward larger and higher tonnage presses for our company is continuing and is not expected to level off or reverse."

Very different was the view of Chicago Molded Products Corp.:

> "Our people feel that for the present, at least, the size of plastic molded parts is levelling off at

This fuse box housing with very thick walls took about 17½ lb. of material. It was molded on a 500-ton press using 15-min. cycle. Heavy-wall pieces undergo terrific strains when released from mold. Cracking is a danger

"There are definite limitations as to size with materials which are presently available. I am talking, of course, about the regular molding compounds which come in either powder or flock form. My reason for this statement is that the shrinkage factors in materials are still too great and, therefore, large pieces undergo terrific strains before they are released from the mold. This may result in cracks which are not visible in the beginning but may prove fatal later. With the improvement of raw materials, undoubtedly larger pieces can be molded, but here again the economics of specific jobs must be weighed very carefully. Naturally, equipment of the individual molder also enters the picture."

Hans Wanders, Northern Industrial Chemical Co.

PHOTO, COURTESY NORTHERN INDUSTRIAL CHEMICAL CO.

PHOTO, COURTESY PLASKON DIV., LIBBEY-OWENS-FORD GLASS CO. AND CONTINENTAL CAN CO., INC.

Above—Seven-part urea scale housing is 18 in. high, 17 in. wide, 16 in. deep. It weighs 3 lb., 13 ounces

PHOTO, COURTESY PLASTICS DIV. LIBBEY-OWENS-FORD GLASS CO. AND GENERAL ELECTRIC CO.

Above—Urea cube steak machine housing is molded in three pieces; the largest (the top), weighs 57 ounces

pieces approximating the size of the large Seeburg speaker housing which weighs 10 lb. and 14 oz. and has a mold cost of $18,000. It is true that larger pieces have been molded. We understand that there is existent somewhere in the industry a mold for producing a 30 by 30-in. table top. The price of the parts, however, is quite high and is scarcely justifiable as compared with laminated table tops and other similar parts employed by the furniture industry. In general, therefore, we should say that the demand for larger sized parts is definitely limited by the cost background, and if we are going to produce still larger parts in the future, it will probably be in new fields which have not been seriously thought of, or at least definitely tried out. However, it seems evident that in order to push ahead into still larger sizes, we shall have to demonstrate greater savings in cost on large-quantity-production items."

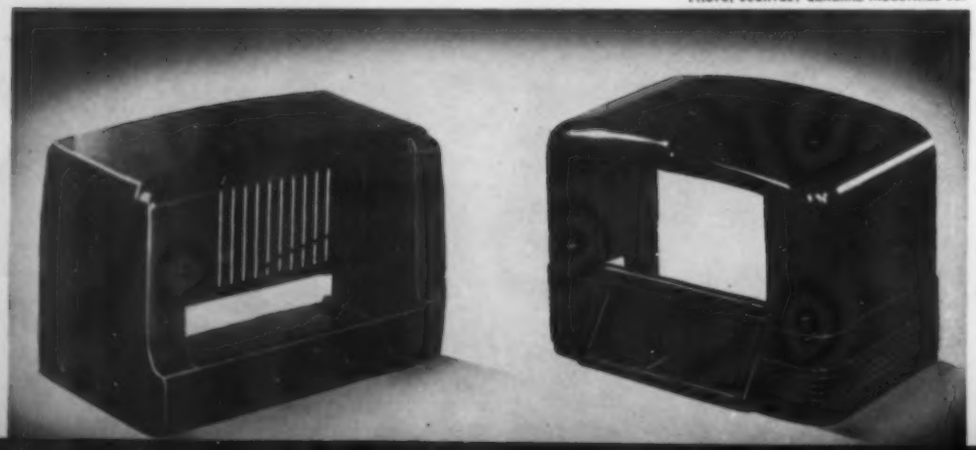
Another angle was stressed by Mr. T. A. O'Brien, general manager of Tech-Art Plastics Co., who urged a "hard-hitting, aggressive sales approach" as one way out. Said he:

"There would seem to be a trend toward larger molded pieces both in the thermosetting and thermoplastic fields. The importance of using molded parts with inserts reduces the assembly time and will continue to increase the potential use of large molded plastic parts particularly for those parts where weight is a controlling factor.

"We feel that when a plastic engineer approaches a customer with an intelligent program, then he can overcome the natural resistance to changes in materials. It is particularly important to have a hard-hitting, aggressive sales approach to take full advantage of the possibilities of making larger compression and transfer molded parts. Engineers and purchasing agents who were familiar with plastic parts during the war provide resistance to the molder today because there was some negligence in the way they obtained molded products during the war period.

"Close tolerances must be maintained. It would amaze a great many people in the industry to know how close some dimensions must be held on these large molded parts, and this story must be

PHOTO, COURTESY GENERAL INDUSTRIES CO.



These radio cabinets are molded on 900-ton press. One weighing 5½ lb. (left) was run at 12 shots per hour; 6¾ lb. model (right) ran only 10 shots per hour

PHOTO, COURTESY PLASTIC MOLDERS, INC.

Above—Silver chest measuring 18 by 12½ in. weighs about 4 pounds. The two parts are molded of urea

told if we are to improve the slight trend that our company finds noticeable at this time."

Mr. S. D. Hiltebrant, sales manager of the General Industries Co., had this to say regarding the trend in transfer and compression molding:

"It is difficult to say how the trend lies, as most of the big molding companies have a few large applications. It would be my thought that the trend toward larger molded pieces is stronger in the injection field as they have until now been limited by the size of the machines. Recently, larger machines have opened up the field considerably. I seriously doubt whether our company will ever buy any larger equipment than we have, as most of our business falls in the range of 225- to 500-ton capacity."

On the subject of material shortages many were apparently optimistic. Typical was Mr. Clarence J. LaClair, president of the Plastic Seat Co., Inc. He predicted that:

"When molding materials for compression or transfer molding become more plentiful, much larger plastic parts will be molded than ever before, as there are several large items that we know of today that would be practical to produce in plastics. We have two new items we will produce the early part of 1948. Both parts will weigh more than 7 lb. each."

The point of almost complete agreement among men who should know is this: the cost is the decisive factor in the customer's decision to produce his part in plastics or not to use plastics.

The final cost of the molded part to the customer is made up of several cost factors which will vary in importance directly in proportion to the number of molded parts required. If only a few parts are needed, the original cost of the mold, amortized over these few pieces, will be the controlling factor, with press hours, material cost and finishing cost following in that order. If, on the other hand, a large number of molded parts

PHOTO, COURTESY MOLDED PRODUCTS CORP. AND ADMIRAL CORP.

Above—This two-piece radio-phonograph cabinet has 5½-lb. base and 3½-lb. cover. The molds cost $30,000

Below—Toilet seat weighing 3½ lb and 2½ lb. lid are molded separately of melamine on a 350-ton press

PHOTO, COURTESY GENERAL AMERICAN TRANSPORTATION CORP.

"The size of the compression molded piece is more limited by the available material rather than by the cost of tools. Our company has presses up to 2000 tons and usually the large parts require special materials inasmuch as the present day general purpose materials are too low in structural qualities—tensile and flexural strengths. The tendency is toward larger parts being made with reinforced materia's, such as the laminates, because of their greater structural strengths."

A. N. Williams, sales manager of the Plastics Div., General American Transportation Corp.

will be required, the mold amortization factor becomes far less important. The difficulty is that generally the larger, heavier pieces are required in small quantities; by way of exception, requirements for radio cabinets are so great that the mold amortization factor is of relatively minor importance. In an item such as a dry cleaning machine agitator or a large, specially designed fuse housing, the production requirements are generally smaller, and for this reason the advantages of plastics materials must be very great before the customer is willing to specify their use.

Low pressure

The recent war boomed the demand for very large plastic pieces to be used, for example, in boats, radar housings and droppable fuel tanks for aircraft. For transfer and compression molders, such orders meant a host of complex technical problems in the construction of great, unwieldy molds and presses. To do the job a new industry arose, that of the low pressure laminators. New resins were developed which would cure with relatively low pressure. Some required only heat and the presence of a catalyst. Duck, fiber glass and sisal were coated or impregnated with these new resins and laid up on forms made of wood, plaster, aluminum or cheaply cast metal. Instead of large hydraulic presses, autoclaves and ovens were all the equipment which was needed.

Mold costs and equipment costs were thus materially reduced, but operation costs rose. Much hand labor was required in tailoring the lay-up, and the time cycle was long. As the war proceeded, efficiency in the low pressure field increased, boosting the output and lowering prices. But when peace came the bubble burst. Metals came back and the new war-born industry, with higher raw material cost and more expensive production methods, could not compete. Today this industry is fighting to find applications in which the superior electrical properties and strength-weight ratio of its products make them practical.

Airplane sections, automobile bodies, house panels and other items have been experimented with, but to date no production method has been developed which makes possible the application of such parts in any major field of industry. True, there has been a wide application of sandwich construction in airplane wings, fuselages. But these requirements are relatively small.

Unless production costs or the price of resins and fillers are reduced, the low-pressure field cannot take up the production of large molded pieces where the compression and transfer field has stopped.

Conclusion

A molder in any field knows that if his mold cost could be drastically reduced, and that if he could buy very large molding equipment for $^1/_{10}$ of what he is required to pay today, a new market for large plastic parts would immediately open up.

We feel that this problem rests directly at the door of the manufacturers of molding materials. If a molding compound could be developed which would only require pressures of about 200 p.s.i., and if it would produce molded parts with a strength, finish and chemical resistance, comparable to the compounds in use, much of the economic problem so apparent today would be solved. Molds could then be made from cast light metals or possibly hammered aluminum or wood. The molder would no longer need anywhere from $5000 to $10,000, or $15,000 to $25,000 as a first cost prior to production and before the customer has seen a sample. His overhead would be drastically lowered. With such a compound the molding industry would find itself faced with the biggest boom ever.

Perhaps that material has already been developed in some laboratory and lies idle while it waits to go to market. If so, bring it on.

PHOTO, COURTESY CHICAGO MOLDED PRODUCTS CORP.

Mold for 30-in. housing for wall-type loudspeaker weighs 5000 lb. and cost $18,000. Almost 11 lb. of materials are used, and curing cycle is only 3 minutes

British lenses combine molding, casting

by DR. DAVID STARKIE, Ph.D, M.Sc.*

Methyl methacrylate and polystyrene lenses have much to contribute to television's progress, this British physicist finds

THE PROSPECTS for low-cost television and for great advances in the entire field of optical design are greatly brightened by the increasing use of transparent plastic lenses and mirrors.

Their high accuracy allows them to be used in television transmitter cameras, in radar guiding signals, oscillographs, self-recording infrared spectrometers and for projecting enlarged images of continuously received printed messages.

Still other uses to which they may be put are: industrial inspection lenses through which a magnified image of tiny machined parts can be viewed with both eyes; condensing systems of newly designed microfilm projectors; rapid camera lenses; parabolic and elliptical mirrors and light-weight binocular prisms.

Not the least of possible uses for plastic lenses is a "searchlight" railway signal which consists of a deep ellipsoidal mirror and two lenses, all plastic, designed to throw an intense light beam down the track (Fig. 2).

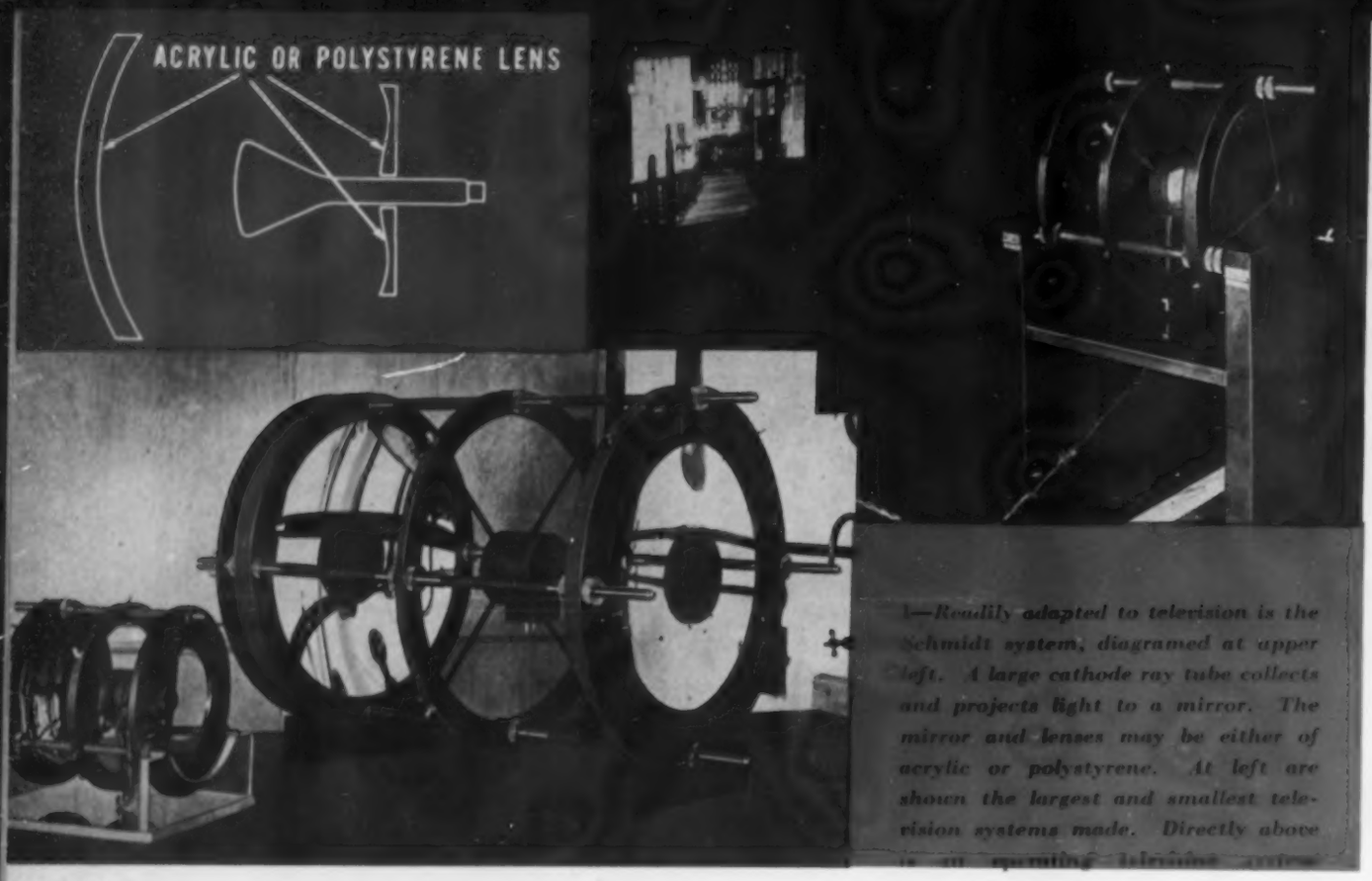
In all of these uses, molded plastics lenses have the advantage over ground and polished glass components in that they are less expensive, are produced more rapidly and obviate laborious hand work. Transparent plastics in these uses also have advantages of high light transmission and good resistance to mechanical and thermal shocks.

Several methods of reproducing plastics lenses from a mold are in use at present in Britain and America.

In one American method of manufacture, the optical component is cast from a liquid, monomeric state to a final solid state inside an optically worked glass mold. The main difficulty in this process is the controlling, to optical accuracy, of the large contraction which takes place on changing from liquid to solid, and many ingenious ways of doing this have been devised. The main advantage of this casting process is that it does insure a good stability in the resulting optical component.

Another American method, employing either sheet methyl methacrylate or the molding powder, involves the use of a semi-positive compression mold, which permits some material to escape as the mold closes. However, the design of the mold is such that when the mold is

* Head of the Optical Dept., Imperial Chemical Industries, Ltd.; originator of new method of manufacturing highly accurate plastic optical components.



1—Readily adapted to television is the Schmidt system, diagramed at upper left. A large cathode ray tube collects and projects light to a mirror. The mirror and lenses may be either of acrylic or polystyrene. At left are shown the largest and smallest television systems made. Directly above is an operating television setup.

fully closed it is, to all intents and purposes, a positive mold. Although lenses made from the sheet have been found to be harder and more resistant to high temperatures than those made from the powder, they are more expensive. For ordinary commercial uses, the molding powder has been found adequate. Injection molding and a combination injection-compression molding process have also been employed to make plastic lenses.

In the British method, developed by Britain's Imperial Chemical Industries, Ltd., blocks of Transpex 1 or 2 (methyl methacrylate and polystyrene, respectively) are compression molded into the required form between optically worked, stainless steel molds—the material having been preformed closely to the finished shape on a lathe. The object of this preforming is to reduce the amount of material displaced during molding. This reduces the strain in the finished component which would cause distortion in use at elevated temperatures. The surface of this molded preform is then built up with a thin skin of the same plastic material until its surface makes accurate contact with the mold.

This process, referred to as the "surface-finishing" process, was the outcome of investigation into methods of fabricating highly accurate plastic optical components, started in Britain in 1941.

Various methods of preparing methyl methacrylate and polystyrene preforms were investigated, and the one finally adopted is closely similar to one already mentioned as being in use in America, namely, the straight casting of the liquid preform in a mold. For a variety of reasons, and particularly with a view to easy operation on a manufacturing scale, the preforms were prepared by including a special light catalyst in the liquid monomer which, when exposed to a powerful source of light, insures an even and speedy change from liquid to solid. A considerable portion of the investigation has been concerned, therefore, with finding suitable light catalysts and conditions under which the castings should be made, as well as making certain that the preforms are perfectly stable and free from any signs of yellowing on subsequent exposure to sunlight during use.

Various methods of controlling contraction during casting have been investigated, and the one finally adopted was to allow the two halves of the mold to be drawn together as in the method of manufacturing Perspex (acrylic) sheet which has been in operation for a number of years. The preform which comes from the mold is surrounded by flash. This is machined off by holding the preform in a vacuum chuck in a lathe after very careful optical centering.

Before proceeding to the next stage of the process, the preform is annealed for 2 hr. at 110° C., followed by slow and carefully controlled cooling to room temperature, to remove any trace of strain which may be present by reason of the preform being firmly attached to the surfaces of the mold during casting.

Casting film on molded preform surface

This preform, placed back in the optically worked mold, will be found to depart very slightly from the exact form of the interior of the mold. To fill up these minute spaces, a thin film of the same plastic used in the preform (the refractive index being perfectly matched to that of the body of the material) is cast on the surface of the preform. This film is so thin that its contraction on casting can be controlled to the necessary accuracy.

Great skill is required in carrying out this part of the process and an exact procedure has been worked out which allows a very high degree of optical accuracy to be obtained. When the mold is opened the finished component, which is ready for immediate use except for a final edging on a vacuum chuck lathe, is taken from it. If optical mirrors are being made, they are coated with a reflecting layer of aluminum by evaporation in a high vacuum. Lenses can be "bloomed" to reduce surface reflections using the same apparatus.

Although this British process for making methyl methacrylate or polystyrene lenses is simple in principle, many practical difficulties have had to be overcome, and a team of research workers has been engaged over the past six years in perfecting it. Two of the main difficulties have been: 1) the perfect matching of the refractive indices of the surface skin and body of the material, and 2) the avoidance of even minute temperature differences throughout the bulk of material while the process was being carried out. The first was overcome by a careful selection of catalysts and strict control of the casting process; the second has involved new methods of temperature control and a close study of heat transfer throughout the materials.

Many workers have attempted to construct machines for generating accurate mold surfaces for lenses automatically but, due to inaccuracies, however minute, in bearings and links, none of these machines has been entirely satisfactory. In preparing molds for the surface-finishing process, the curves are machined to accurate templates followed by hand working, using flexible laps to obtain the required degree of accuracy.

New tests

The skilled optical worker has been provided with a series of new and accurate tests which enable him to follow the progress of his work. The first test, for instance, provides him with an actual picture of the contour of his mold, accurate to 0.0001 in., and the subsequent tests increase in accuracy until the final critical optical test is carried out. Although practice has speeded up the preparation of these lens molds appreciably, the time required to make a mold is still lengthy and is only justified by the fact that, once the mold is made, a considerable number of plastic reproductions can be made from it.

It takes several hours to make an optical component by the surface-finishing process, although the actual handling time by the operators is short. Therefore, the obvious way to manufacture components by the process so as to keep the production costs low and allow large-scale use in the various applications, is to use a large number of molds and allow them to travel through the various stages of the process on a mechanical conveyor. Imperial Chemical Industries, Ltd., are preparing a factory to be operated along these lines. It is hoped to begin manufacture towards the end of this year and build up to full scale production during 1948.

Television will be among the first fields for plastic lenses, made by the surface-finishing process. It is generally agreed that the television picture on the curved end of the cathode ray tube provided by the present home receiver would be improved by a much larger, preferably flat picture. Very large cathode ray tubes are bulky and expensive, and it is considered that the most satisfactory way of obtaining the desired result is to project an enlarged picture from a small tube on to a separate screen by means of an optical system. Unfortunately, there is a limit to the brightness of the cathode ray tube picture which can be obtained with a domestic receiver. To give a satisfactory projected picture, an optical system of great light gathering power is needed.

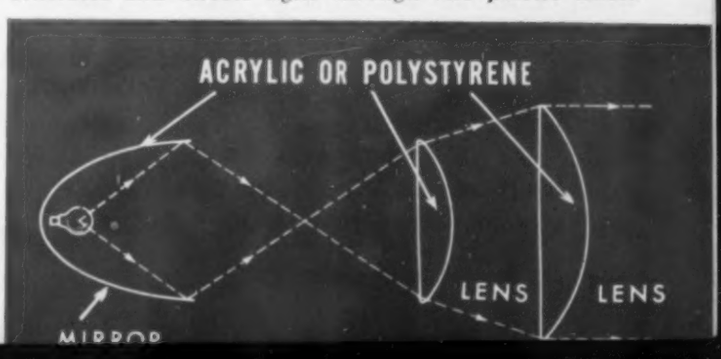
Schmidt system

Most satisfactory is the Schmidt system (Fig. 1), originally designed for use as an astronomical telescope and well suited for television projection. It consists of a large-aperture spherical mirror facing the cathode ray tube, which collects and projects forward a large solid angle of light from the tube; together with an aspheric corrector plate situated at the center of curvature of the mirror to correct the spherical aberration given by it.

Many workers in both Britain and America have been working on means of making systems of this type to the accuracy required and at an economic price. It is felt that the British surface-finishing process is capable of producing lenses with sufficient accuracy to provide a high intensity screen picture, capable of being viewed easily in normal room lighting and with the necessary contrast between black and white. Two prototype systems to take $2^1/_4$-in. diameter and $3^1/_2$-in. diameter cathode ray tubes, respectively, have been demonstrated and first supplies should be in the hands of the British television firms shortly. A very large-aperture Schmidt system for television projection in motion-picture theaters has also been shown and practical trials in British theaters will be carried out during the next few weeks. All these systems have an f/ number of 0.75 and all will be produced by the surface-finishing process at costs low enough to allow them to be widely adopted for use in television receivers of all types.

All these systems and components which may be required in substantial quantities, are particularly suitable for manufacture by the surface-finishing process. By making available relatively inexpensive, accurate components, this process should have a great influence on the trend of optical design in the future, and arrangements are already being made to enable the fullest advantage to be taken of the capabilities of the process.

2—The searchlight employs a plastic mirror which concentrates and directs light through two plastic lenses



These kids are forming their own balloons out of a vinyl-based plastic. How their toy was developed, made safe and playworthy is an example of sound plastics engineering

Vinyl balloons, a booming kid craze

FROM all indications, the children of the nation may be treated to a new fad—blowing their own home-made balloons from a little gob of plastic based on Vinylite resin. How these balloons were made playworthy and safe is a story of skilled plastics technique and the adaptable properties of the material.

The makers of the ingenious new toy, Bub-O-Loon, Inc., of New York City, faced a series of difficult problems before they hit the market. Originally the product, while it was all that it need be by way of amusement, had a potentially dangerous flaw. Because of the solvents first used in its compounding, the material was flammable.

Then began the experiments combining the vinyl with other solvents, each in turn, until a combination was found which, if ignited in mass form, will extinguish itself. In balloon form, the material can be held directly over a flame and not burn at all—just shrivel up.

Technical troubles

Less significant but nonetheless handicaps to the launching of the product were the tackiness and viscosity of the material. First, the tube-filling machines had to be modified to handle the viscous material. Then, the formulae had to be varied until the toy could be comfortably used by the consumer.

In its final form, as it is now being sold, Bub-O-Loon consists of a tube containing the vinyl-based plastic, and a special blower. The size of the balloon depends on the amount of material placed on the end of the blower; its shape on the skill of the operator. Irridescent in sunshine, it will float in air like any other balloon.

Particularly valuable is the self-sealing characteristic of this plastic balloon. If punctured, it does not explode or collapse. All the kid need do is pinch the balloon together again at the hole and it is as good as new.

The vinyl-based plastic, which is of the same type used in packaging many foods, is said to be non-toxic, tasteless and odorless. The material for this package comes in tubes holding 1 or 2 ounces.

Production booming

Although 225,000 tubes of the balloon material are being turned out per day, company spokesmen expect the output to shoot up shortly to approximately 450,000 tubes a day.

The company uses its own formula and does its own mixing, but various plants are employed to fill, pack and ship the finished product. The blower, a cellulose acetate tube, is extruded by Extruded Plastics, Inc., Norwalk, Conn.

Nationwide distribution of the toy is planned through jobbers, chain stores and department stores. The company hopes to repackage their item early next year, by which time they expect that the initial reception will have been stabilized into a steady demand.

The application, sound because it is not only novel but genuinely entertaining, and above all, because it is safe, emphasizes yet again the opportunities in the toy field for soundly and imaginatively applied plastics.

Tailor-made polyester resin

SOME of the silence surrounding the whole low-pressure plastics field in recent months may have been due to the fact that contact laminators, low pressure molders and polyester casters have been temporarily stymied by a lack of standards.

This fact was brought out at the Low Pressure Conference in Chicago during the SPI convention last May. Polyester resin makers said to molders and laminators "Tell us what you want, and we'll give it to you. But right now you want a different resin for every job. That's expensive and that takes time." The low pressure men replied, in effect, "We find it necessary to take time to doctor every resin on a trial-and-error basis for every piece of work. When we can order resins by number all our problems will be simplified."

One of the first answers to the problem has come from Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh 22, Pa., with its Selectron 5000 resins, a series of clear, fast-curing thermosetting copolymer resins. Most of the resins are composed of styrene modified unsaturated polyesters though other unsaturated compounds sometimes replace styrene. They are furnished and applied at 100 percent solids, and are cured at moderate temperatures without the elimination of water or other volatile by-products. They may be cured in the presence or absence of pressure and with or without pigments, dyes, fillers and reinforcing materials.

Each member of the Selectron 5000 series has been designed to meet a specific application or type of application. Thus, monomers are available at almost any viscosity, with differing adhesive qualities and capable of curing under any practical operating conditions. Within limits, the resins will be made available in specifications individually adapted to each customer's needs.

The fully cured resins vary as widely as do the monomers. Applied in impregnating, laminating, casting or molding operations or as adhesives, they differ in strength, hardness, flexibility, resistance to heat, electrical properties and other properties.

The Selectron 5000 series has been divided into physically and functionally related groups, and identifying series of codes have been assigned to each group. The code series are generally identified as follows:

Group I—Selectron 5000–5200, rigid resins, liquid monomers.

Group II—Selectron 5200–5400, flexible resins.

Group III—Selectron 5400–5500, rigid resins; solid or paste monomers.

Group IV—Selectron 5500–5700, pigment paste or soluble color concentrates compatible with all Selectron 5000 series resins.

Group V—Selectron 5700–5900, impregnating, coating and adhesive resins.

The grouping and coding of Selectron 5000 resins has meant not only simpler low pressure molding and laminating operations; it has made possible new applications where standard handling methods are an advantage.

Cinder block can be treated with one of these resins in color for decorative building work. Golf club heads are made from another by casting with glass fiber filler or by lamination. Croquet mallets, bowling balls, pins and other things using hard wood for impact use may be made from filled copolymers. Indeed, a worn wooden item may have resin cast around it to reshape it.

Other outlets for the material include radio cabinets and castings of specimens either by technicians or hobbyists. Jewelry, buttons and ornaments can be made in almost any range of flexibility, opening more markets. A sheet of copolymer film laminated to enamelled metal for pop or beer bottle caps will stamp out with the metal, making a permanent protective film on the caps.

Possible further uses are limited only by the imagination.

Group I resins

Group I (Selectron 5000–5200 resins) includes the largest number and most generally useful resins of the series. It presents also the broadest range of properties, even though limited to rigid resins having liquid monomers. Included are a range of broadly varying laminating resins: resins particularly designed for casting applications; resins chiefly characterized by speed of cure, by resistance to distortion at elevated temperatures; nonburning resins; resins of high impact strength, etc.

Physical and chemical properties of individual members of the group have been measured on unfilled cast polymers and typical laminates. Tables I and II (pages 112 and 115) show average values of representative group members.

Group II resins

Group II (Selection 5200–5400 resins) is lim-

ited to flexible resins, all of which are now available as liquid monomers. The group includes a number of resins widely variant in properties of monomer and polymer. Individual members of the group are much less readily modified than are their rigid analogues. Retention of flexibility, strength and toughness is dependent upon fine control of composition within narrow structural limits.

These resins are widely useful in the production of flexible laminates and for the impregnation of porous flexible materials. Available at varying flexibility and with differing electrical properties, all members of the series exhibit a high order of oil, grease and hydrocarbon resistance.

Water resistance is also good, the combination of properties suggesting the use of Group II resins in floor, wall and table coverings, electrical applications and for the impregnation of paper and leather as well as other porous materials.

Group II resins are likewise useful as plasticizers for Group I rigid resins. Compatible in all proportions and converting to completely non-volatile end-products, they become excellent permanent plasticizers.

Group III resins

Group III (Selectron 5400–5500 resins) includes rigid resins having solid or paste-type monomers. Designed for special types of lamination, members of the group are not available in the wide range of properties characteristic of previous series. Newer modifications can be made, but basically, Group III is an inflexible series.

Solid or paste-type monomers are used in laminating where the characteristic tackiness of liquid monomers is undesirable. The resins are melted, catalyzed and applied in molten form. After the base material is impregnated, the resin is resolidified by cooling, whereafter the impregnated stock may be rolled or stacked, and stored for lamination at some later time. Storage for several weeks, or even longer, before final lamination is perfectly feasible.

Group III resins are particularly indicated in applications involving large odd-shaped laminated articles where considerable shaping and tailoring is required. The impregnated base material can be tried and cut and tried again without dislocating resin or disturbing other portions of the lay-up.

Group IV resins

When it is desirable to produce colored castings, moldings or laminates by addition of dyestuffs or pigments to a Selectron 5000 resin, an extended series of soluble color and pigment paste concentrates (Selectron 5500–5700 color concentrates) are made available specifically for use with them. Group IV codes have been reserved for these.

Selectron pigment paste concentrates are prepared by dispersing and fine grinding of selected high quality pigments in a resinous carrier which is, itself, reactive and becomes an integral part of the cured resin. The pigment solids vary, depending upon the character of the pigment and the solids requirements for producing full hiding and gloss.

Up to 20 percent of paste concentrate may be added in certain applications, although usually 3 to 6 percent

Table I.—Average Physical Properties of Products Made with Selectron 5000 Resins

	Unfilled Selectron 5000–5200 polymers	*Selectron 5000–5200*			*Unfilled Selectron 5200–5400 polymers*	*Unfilled cast Selectron 5400–5500 polymers*	*Selectron 5400–5500 glass cloth laminates*
		Paper laminates	*Cotton-cloth laminates*	*Fiberglas laminates*			
Specific gravity (at 77° F.)	1.2	1.3	1.3	1.6	1.2	1.26	1.70
Hardness: Barcol impressor	50	45	45	60	0	50	60
Rockwell M	115	100	100	115	0	116	115
Tensile strength at 77° F., p.s.i.	6,000	8,000	8,000	35,000	850	6,000	37,500
Flexural strength at 77° F., p.s.i.	13,000	11,000	13,000	35,000	...	7,900	33,000
Compressive strength at 77° F., p.s.i.	25,000	20,000	20,000	30,000	...	28,400	12,400
Modulus of elasticity in tension, p.s.i.	570,000	860,000	1,000,000	2,500,000	...	710,000	1,250,000
Modulus of elasticity in flexure, p.s.i.	550,000	1,500,000	1,000,000	2,200,000	...	410,000	2,100,000
Modulus of elasticity in compression, p.s.i.	500,000	600,000	500,000	500,000	...	...	1,670,000
Tan. prop. limit in compression, p.s.i.	...	...	...	...	...	15,800	...
Unnotched izod impact strength, ft.-lb.	0.7	...	...	...	1.3	2.0	...
Notched izod impact strength ft.-lb./in. of notch	...	0.8	2.0	30.0	...	...	20.9
Abrasion resistance, Taber, times Plexiglas	1 to 6	...	...	...	...	5.0	...
Heat distortion point	190 to 330 (° F.)	...	...	...	...	110 (° C.)	...
Bonding strength, p.s.i.	...	800	1,000	1,200	...	...	694

COLOR PLATES, COURTESY PITTSBURGH PLATE GLASS CO.

Properties of these resins range so widely that they can be molded, cast or used in laminates

will be ample. The pastes are readily dispersed by stirring into the body of the resin before addition of the catalyst. In the case of special laminates where higher pigment concentrations are occasionally required, special pigment grinds will be supplied.

The soluble color concentrates are concentrated solutions of selected soluble dyestuffs particularly adapted to this group of resins. They are used by addition to the resin before or during addition of catalyst in amounts required to produce the desired depth of shade. In no case are there more than five parts used per hundred of the less intense colors and $^{2}/_{10}$ part per hundred of the intense blues, blacks and violets.

Soluble colors and pigment pastes may be used in combination. It is frequently convenient to use Selectron White Paste Concentrate 5521 as the opacifying agent and soluble color concentrates as the tint.

Group V resins

Group V (Selectron 5700–5900 resins) includes resins designed for application as adhesives and very highly specialized surface coatings. Members of the group are distinguished from resins in Groups I and II by exhibiting a high order of adhesion to metal, glass, hard rubber, wood and similar smooth surfaces. More exothermic in cure than the other resins, they are preferably limited to use in reasonably thin sections or films. Thus, they are particularly recommended as adhesives for metal foil to paper, glass to glass, laminated plastics, hard rubber, etc., to similar or dissimilar materials.

Members of the series are available at varying flexibilities and over a range of monomer viscosities. They have an extremely rapid cure. In some applications where heat losses by radiation can be minimized, it is necessary only to start gelation, adequate cure being completed by exothermic heat of the curing reaction. This characteristic appears especially useful in high-speed, continuous operations.

Other applications for which members of the group are well adapted are as special surface coatings for porous materials such as rough textile, cellular glass, asbestos board, fibre board and similar surfaces requiring surface impregnation. Open mesh materials may be readily bridged using a resin of properly selected viscosity and surface tension characteristics. Heavier than usual coatings may be applied because these resins in common with other members of the general series are supplied at 100 percent resin solids.

The use of a special Selectron Cobalt Accelerator for 5000 series resins cured in contact with air, is especially recommended for most members of Group V. A maximum of 4 percent, and usually 2 percent or less, added during addition of peroxide, insures rapid, thorough cure even on fully exposed surfaces.

First uses in laminates

Although curing characteristics of the series of resins are widely varied, all members of the series follow the same general pattern. The curing cycle involves, first, conversion to a gel followed immediately and, in some cases, almost simultaneously by further polymerization into final thermoset form. During the polymerization process the resin undergoes a gradual shrinkage. Ultimate strength, hardness and other characteristic properties develop during the later stages of the cure.

Standards of gel time and minimum cure are maintained for each resin.

The earliest resins in this group were developed for

laminating applications and many of them are still particularly adapted to the purpose. Laminates may be prepared by saturating a base material—duck, muslin, paper, glass cloth fabric, etc.—with a catalyzed resin, building up to suitable thickness and curing under contact pressure. It is only necessary that pressure be adequate to eliminate irregularities in the surfaces and to assure contact between the several plies. These resins are declared to be completely converted during cure, do not eliminate water or other volatile by-products and hence do not require high pressures. Pressure does not interfere with cure, however, and moderate pressures of 5 to 250 p.s.i. are sometimes used as a means of controlling the resin content of the finished laminate.

The base material may be saturated with catalyzed resin in continuous machines or by any convenient method. The strength and overall properties of finished laminates reach their best values when the laminating base has been thoroughly wetted with the resin. In cases of materials such as certain glass cloth fabrics which are not easily wet with resin, it is desirable to soak well before laminating. This is frequently accomplished by rolling the impregnated cloth wrapping and storing the roll for several hours in a cool, dark place before completing the lamination. As an alternative procedure, the fabric may be impregnated with uncatalyzed resin, rolled and stored over long periods of time and finally sprayed with catalyst immediately before lamination. Strength values and other properties are greatly enhanced by these methods.

Curing the laminates may be done between glass, metal, plaster, wood or other mold surfaces, between steel platens, or in a vacuum bag, used particularly for odd or irregularly shaped laminates. Whatever the mold or method used, complete cures are usually obtained in 1 to 30 min. at 200 to 300° F. The actual time required after the piece reaches the curing temperature is usually quite short but varies with the amount of catalyst, the temperature, thickness of laminate and choice of resin.

All resins in the series are mildly inhibited by air. Surfaces of laminates or cast articles exposed to air during cure may exhibit objectionable residual tackiness. Air may be excluded during cure by using enclosed molds or platens or by covering with cellophane or polyvinyl alcohol film. If curing in air cannot be avoided, Selectron Cobalt Accelerator, compatible with all resins in the series, is available and is generally effective in concentrations of 2 percent or less.

Casting and molding operations

Some members of the series are particularly adapted to casting and molding operations, and may be cast or molded in transparent form or extended with dyes, pigments, reinforcing fibres or other fillers.

In the production of clear castings, it is generally desirable to use tertiary butyl hydroperoxide as the catalyst. Up to 0.5 percent is recommended for small castings or castings in thin sections, and lesser amounts down to 0.1 percent for castings in thick sections. After the resin is poured, curing is carried out as a two-stage process. The first stage is one of mildly exothermic gelation during which the resin sets to a rubbery gel. It is accomplished at room temperature or at slightly elevated but stable temperatures and requires from $^1/_2$ to 6 hr. depending upon the size of the casting and the amount of catalyst employed.

The second stage involves completing the cure at elevated temperature, and is less critical than the first. The gel is heated until fully converted, a matter of 15 to 30 min. at 250 to 260° F. It is desirable in the case

The variety of properties offered by the five resin groups is further extended by special formulations

of large castings to raise the temperature gradually to full curing levels and the finished piece may likewise be gradually cooled.

The casting of colored Selectron 5000 resins follows much the same schedule. When fillers and extenders are incorporated, casting and molding operations become less critical and may be completed on faster schedules. Suitable fillers include molding sand, whiting and fibrous materials, such as alpha-cellulose, asbestos, cotton linters, rayon and glass flock. Molding may be carried out after addition of the catalyst either in preheated molds or by heating in a mold filled at room temperature. Pressure may be used, but most compositions do not require it except in complicated cavities which may not be filled by normal flow.

Casting and molding compositions may be cured at temperatures from 200 to 300° F. The different resins cure at different rates which are further varied depending on temperature, mold design, filler or extender content and other factors. Faster cures are naturally attained at higher temperatures and, under certain conditions, slightly elevated pressures may be used to permit higher than normal curing temperatures.

Molds may be constructed of any convenient material such as glass, ceramic, metal, wood, plaster, wax, paper or rubber. In most cases, it is necessary to use a mold lubricant to insure ready partition from the mold. Carnauba wax emulsions have been successfully used. Proprietary mold release materials generally effective, are: "Ortholeum" 162,[1] Vejin A-3[2] and Dow-Corning Flind #200.[3] All of them may be applied by wiping or spraying in the mold cavity and lightly buffing to remove excess lubricant.

Since most of the resins are rarely, if ever, inhibited by the presence of copper, iron, other metals or rubber, inserts or imbedments of many types are possible. It is only necessary to cure the resin more carefully to accommodate differences in the coefficients of expansion.

Catalysts

These resins require peroxide catalysts, such as benzoyl peroxide or tertiary butyl hydroperoxide, to permit rapid curing of the resins at moderate temperatures. The paste-type materials dissolve rapidly and are generally convenient to use. Tertiary butyl hydroperoxide is a liquid catalyst, and is particularly convenient to dissolve in all members of the series.

Catalysts which have been used successfully with Selectron 5000 resins include: lucidol benzoyl peroxide,[4] luperco A.T.C. (paste type),[4] organic peroxide FL,[5] tertiary butyl hydroperoxide.[6]

Storage stability and tank life

Before addition of catalyst these resins are stable in excess of four months when stored at temperatures below 80° F. At lower temperatures, 40° F. or lower, they are stable for much longer periods of time. They are photosensitive, and quantities stored in the laboratory in glass containers may thicken in a few days' time if subjected to direct sunlight or diffused light.

After addition of catalyst the resins may be usable from a few hours to several days, depending on the modification ordered. It is a property which is interrelated with the gel time and curing time required, the kind and quantity of catalyst employed, operating temperatures, the presence or absence of light and other properties. Within the limits imposed by unusual extremes in these conditions, the tank life is adjusted to meet the requirements of the individual customer.

Table II.—Chemical and Electrical Properties of Products Made with Selectron 5000 Resins

	Group I resins 5000–5200 polymers	*Group II resins 5200–5400 polymers*
Heat Stability		
Degree of checking	0	...
Time of checking, hr.	Greater than 48	...
Weight loss, % after 1 hr. at 240° F.	0.36	...
Electrical Properties		
Dielectric strength ($^1/_{16}$ in. thick)	500 volts/mil.	400 volts/mil.
Arc resistance	100 sec.	80 sec.
Dielectric constant:		
at 60 cycles	3.35	6.25
at 1000 cycles	3.15	5.4
at 1,000,000 cycles	3.00	4.0
Power factor:		
at 60 cycles	0.016	0.13
at 1000 cycles	0.003	0.04
at 1,000,000 cycles	0.011	0.05
Loss factor.		
at 60 cycles	0.05	0.81
at 1000 cycles	0.01	0.21
at 1,000,000	0.03	0.20
Chemical Resistance		
Water	Excellent	Good
Aliphatic hydrocarbons	Excellent	Good
Aromatic hydrocarbons	Excellent	Poor
Mineral oils	Excellent	Good
Vegetable oils	Excellent	Good
Chlorinated solvents	Poor	Poor
Dilute acids	Excellent	Good
Concentrated acids	Fair	Fair
Dilute alkalis	Fa r	Fair
Concentrated alkalis	Poor	Poor

Technical service and data

The selection of the best adapted resin depends upon a complete understanding of any special condition of application or service. In working on special applications, it will occasionally be necessary to modify existing resins or to prepare entirely new compositions. In some cases, the new modifications or new resins will be supplied in small experimental quantities under an experimental code. As soon as performance standards have been established, however, regular codes falling within the proper group classification are applied.

[1] E. I. du Pont de Nemours & Co., Inc., Petroleum Chemical Div., Wilmington 98, Del.
[2] Vejin, Inc., Cincinnati, Ohio.
[3] Dow-Corning Corp., Box 592, Midland, Mich.
[4] Lucidol Corp., 1740 Military Rd., Buffalo, N. Y.
[5] Becco Sales Corp., Station B, Buffalo, N. Y.
[6] Union Bay State Co., Harvard and Main streets, Cambridge, Mass.

1—At left is assembled camera; above are the five phenolic parts and cellulose acetate window. Housing proper, back cover and the flash case are transfer molded; the knob and lens housing compression molded

More plastics in cameras

After a 10-year test, plastic components are valued in high-price cameras as well as in those produced for mass market

2—Dimensional stability of woodflour-filled phenolic led to its selection for this camera housing. Cellulose acetate was chosen for the back because of proven toughness, resiliency

IN A LITTLE over 10 years since Eastman Kodak Co. first pioneered in plastic housings for cameras, a lot of progress has been made in camera manufacture. Much of that progress has been concerned with the increased use of plastics in cameras.

The progress has been in two directions: 1) in the improved acceptance of plastics as component materials for high-priced cameras and 2) in the application of advanced design, molding and assembly techniques so that the use of plastics might result in less costly but better cameras for the mass markets. Phenolics, cellulose acetate, cellulose acetate butyrate, polystyrene and ethyl cellulose are all being used in today's cameras.

Plastics in an expensive camera

In the high-priced field Eastman Kodak Co., Rochester 4, N. Y., uses phenolics in its Kodak 35 cameras (Fig. 3). Retailing between $60 and $80, these instruments are produced in three models having f/3.5 and f/4.5 lenses, various shutter and range finder equipment.

Since a miniature camera must be compact, a good design dictated either the use of plastics or die castings. The final selection of plastics was made for reasons of weight and economy. Durez high-impact phenolic was chosen for dimensional stability and strength. The same mold serves all three models—the 2-part housing,

PHOTO, COURTESY EASTMAN KODAK CO.

3—Lightweight, compactness and strength are among the advantages imparted to this camera through use of plastics. The two-part housing is molded of phenolic while wind and rewind knobs, bushings, washers are of cellulose acetate butyrate

case and back, being molded by the Die Molding Corp. of Canastota, N. Y., from pelletted material in a 4-cavity mold.

The housing is held to an over-all tolerance of 0.020 in. in 5 in., and cases and backs are matched to insure good fit. Comparatively few finishing operations are required. Flash is machined off, dead-end holes are drilled for self-tapping screws, a groove is notched around barrel of case to provide a light-lock for lens mount, and barrel is sand-blasted to prevent reflections.

The wind and rewind knobs by which film is transported are molded of Tenite II. Eight cavities, four for each knob, are incorporated in the die, metal inserts being molded in. Other plastic parts used in the camera include a bushing and two small washers which are parts of the flash shutter assembly. These are machined from Tenite II rod stock.

Cellulose acetate butyrate was selected for these parts because of its toughness, color, feel, rapidity of molding and, in the case of the bushings and washers, because of its insulating properties.

Advantages of plastics in low-cost cameras

In the popular-priced camera field, manufacturers have found that use of plastics cuts assembly operations to a minimum thus facilitating mass production, while good molding assures that all parts are identical. Coring of plastic parts can be accomplished in the mold, whereas with metal stampings, a number of punching operations are required.

Plastic housings are being entrusted with more delicate shutter and lens assemblies. This must be attributed to a greater confidence in plastics and a knowledge of how they can be molded into housings which are amply strong to protect camera parts.

Camera with flash—A camera built to withstand harder than ordinary use is the Fed-Flash, molded by Consolidated Molded Products Corp., 309 Cherry St., Scranton, Pa., for Federal Mfg. & Engineering Corp., Brooklyn, N. Y. The set, which includes a synchronized flash attachment, 16-mm. fixed focus lens, built-in view finder and shutter release, retails for about $15. Careful selection of material for six camera parts and sound molding methods make low price possible.

Five plastic parts that go into the camera (Fig. 1) are molded of a general purpose phenolic, specially formulated by the molder. To solve problems faced when producing several parts with molded-in holes, held to close tolerances, the molder used separate molds for each part. For great flexibility and economy in production, two different types of molding were employed. Three of the five plastic parts are transfer-molded—the housing proper, the back cover and the flash case. Of these, the first two parts are molded in 2-cavity dies in a $1\frac{1}{2}$ to 3-min. cycle. Dies have hobbed cavities and built-up sectional forces, are highly polished to produce smooth surfaced sections and sand-blasted to produce the dulled inside surface and the grained leather-like exterior surface. Upon removal from the mold, these parts are mounted on shrink frames for about 3 min. to maintain tolerances and minimize distortion. The flash case which holds two tiny batteries is transfer molded in an 8-cavity die and requires no finishing except flash and sprue removal.

Both the film-winding knob and the lens housing are compression-molded—the former in a 10-cavity die incorporating metal inserts and the latter in an 8-cavity die. Both parts are tumble finished. The manufacturer, who does all assembling, rivets the metal plate on the lens mount and inserts ratchet-control on knob.

The little window frame (Fig. 1) is stamped out of acetate sheet and is glued over the view finder.

One of the plus values offered by plastics—its insulating property—has been put to use by the Fed-Flash. This property makes it possible to store two batteries and wires in the flash housing and allows the synchronizer to operate within the camera housing without additional insulation.

Camera with leather bellows eliminated—The Beacon camera (Fig. 7) is a new version of the folding-type camera and has four plastic parts—carcass, back cover, front cover and shutter box. A black phenolic with woodflour filler is used by General Electric Co., 1 Plastics Ave., Pittsfield, Mass., in compression-

4—Cellulose acetate butyrate was used in front, back, focusing barrel, lens cap. Focusing barrel can be adjusted for picture ranges from 2 ft. to infinity

5—Close-tolerance molding was needed to allow shutter-box to slide easily, as shown by the arrows in cutaways

molding the parts for Whitehouse Products, Inc., 360 Furman St., Brooklyn, N. Y. Through the use of plastic, this camera does away with the leather bellows that sometimes troubled camera fans because of the development of pin holes and creases that exposed film to unwanted light. The shutter box replaces bellows.

The chief problem in producing the Beacon lay in keeping a close control over the plastic compound and the tool work so that there would be no difficulty in assembling parts molded at one time with parts molded at another. This was important for three reasons. First, parts are assembled by the manufacturer at a convenient time rather than right after molding is completed. Not wishing to be bothered with matching sets, the manufacturer insisted that all parts fit together properly. Second, light leaks in on the film when parts are not kept within narrow tolerances. Third, proper operation of the camera depends greatly on the ease with which the shutter box slides in and out.

A slide metal hinge joining the front and back of the camera and a spring lock on the other side keeps the camera compactly closed and prevents the two parts from becoming detached when films are loaded.

A reflex camera in plastic—The Spartus Full-Vue is one of the reflex cameras that has gained much popularity of late. A ground-glass finder, two lenses—one for viewing and one for taking pictures—compactness and simplicity of operation are among its features.

This camera is molded by Midwest Molding Mfg. Co., 319 N. Whipple St., Chicago, Ill., for the Spencer Co., 715 W. Lake St., of the same city. Bakelite is used for larger sections while Tenite I and II are used for other parts. Compression-molded of phenolic are the two sides which are formed separately, and the back and bottom which is in one piece. The hood or top section is injection-molded of cellulose acetate butyrate; the two lens mountings of cellulose acetate. The front is a metal plate which is fastened to the shoulders of the sides by means of metal screws. To assemble the lens mounts to the metal plate, the molder inserts them in front, heat-rolls inside for firm grip.

Camera with focusing equipment—Tenite II is used effectively for the housing of the revolutionary new Comet. As the first low-priced camera with a focusing apparatus, it demanded exacting workmanship in construction. Toughness was the primary reason for the selection of cellulose acetate butyrate by the molder, Elmer E. Mills Corp., 153 W. Huron St., Chicago, Ill., and the manufacturer, Zenith Camera Corp., 36 S. State St., Chicago. This plastic's resistance to moisture was also a determining factor. Even though a bright color could have been used, it was decided to mold the camera in black since the public associates that color with expensive camera equipment.

The plastics parts are four in number: front, back, focusing barrel and lens cap. The front and back are well ribbed to prevent possible warpage and, as an extra precaution, a steel stamping reinforcement is riveted inside the back. Light leakage is prevented by tongue-in-groove constructions where parts are fitted

together. Openings for front and rear viewing windows and for the lens are molded with a lip that not only bars light from entering but provides a ledge on which windows and lens may be heat sealed into position.

The focusing barrel is the most important feature of this camera. Close tolerances have been held in this part so that it can be adjusted for picture ranges from 2 ft. to infinity (Fig. 5). A firm fit between barrel and front is further assured by a phosphor bronze spring.

The newest model of the Comet is made to accommodate flash attachment. Its housing is also plastic.

Camera with polystyrene or ethyl cellulose housing—The Silver King and the Champion (Fig. 6) are twin cameras molded of Styron or Celcon, for the Camera Man, Inc., 14 W. Lake St., Chicago, Ill., by Anfinsen Plastic Molding of Aurora, Ill. At a glance the cameras look alike but they are not identical. The Silver Sing has a zinc metal die cast back while the Champion back is molded of plastic as is its front housing. Each camera is molded in a 3-cavity die.

Plastic parts of the Champion are the front, back and mount for the fixed focus lens. Those of the Silver King are the front, lens mount and an insert which fits into the back of the built-up decorative piece on the top edge of the camera. This insert can only be seen from the rear of the camera and serves to obviate the need for a thick section in the body piece at this point. Hence the front is molded with an opening for the insert. All assembly work on these cameras is handled by RNJ Plastic Products, Aurora, Ill.

Thermoset and thermoplastic materials combined—The interesting thing about the Falcon camera (Fig. 2) is the combination of thermosetting and thermoplastics in the housing. Chicago Molded Products Corp., 1020 N. Kolmar Ave., Chicago 51, Ill., which molds the camera for Falcon Camera Co., 173 W. Madison of Chicago, had a reason for this choice.

Obvious to all camera molders is the fact that housings must of necessity be rigid and possess dimensional stability. The separable parts must also fit securely to prevent the entrance of light. Taking these factors into consideration the engineers at Chicago Molded Products Corp. thought it best to use a phenolic material with woodflour filler for the camera case, forming it in a 6-cavity steam-compression mold. The materials chosen were Resinox and Bakelite. For the back, the requirements indicated the use of a cellulose acetate, Lumarith in this case, because of its toughness and resiliency. The inherent springiness in the material causes the back to snap tightly in place providing a light seal around the entire edge of the camera. Injection-molding is of course used for the back section.

Reasons for more plastics in cameras

Strength, stability, uniformity, speed of production and assembly—these are all factors in the trend towards the use of more plastics in cameras. There are others. Only plastics could provide a dull molded finish to the inside of parts, eliminating the paint formerly used to prevent light from reflecting on films. Only plastics could be molded to give leather-covered metal appearance which many expect in a camera.

6 (Right)—Polpstyrene or ethyl cellulose is used in these cameras. Back of camera, top left, is of zinc

7 (Left)—New version of the folding-type camera has four phenolic parts—a carcass, a back cover, front cover and shutter box. The molded shutter box replaces the leather bellows previously used

Plastics

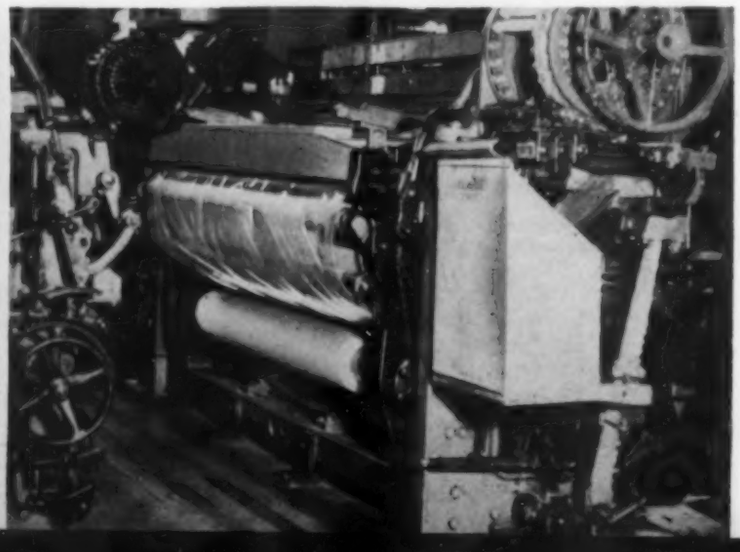
A one-piece combination handle and vibrator housing of plastic contributes light weight and functional design to the new Electro-Shav Rhythm Blade safety razor, produced by H. D. Campbell Co. The plastic units are of black general-purpose phenolic or of ivory urea, compression molded by the Globe Imperial Corp. in a 4-cavity split-type die

For the sportsman's desk or den, the Homer Landsdowne Co. is distributing these book ends with duck heads molded of Chemaco cellulose acetate by Majestic Molded Products, Inc. Realistic heads are available in either light or dark colors. They are durable, shatter-resistant, easy to keep clean and will long retain their attractive appearance

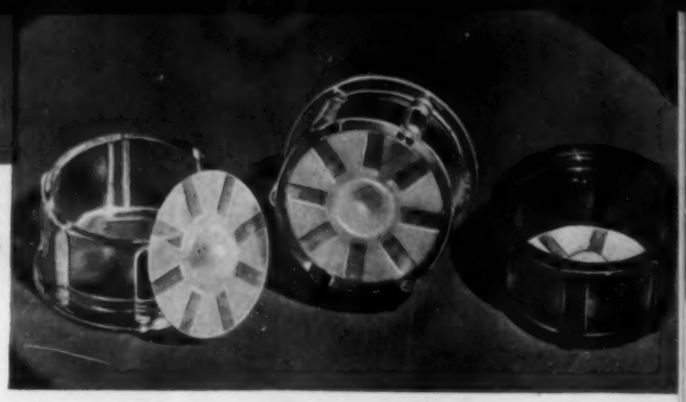
Addresses of firms mentioned here may be found on page 244

Mickey, the kicking mule, is injection molded of polystyrene in a 2-cavity mold for the Practi-Cole Products, Inc., by Teal Molding Co. Remaining parts of ivory Beetle or red Resinox are compression molded in a 10-cavity mold. Meshing of gears in converse circles fascinates all children

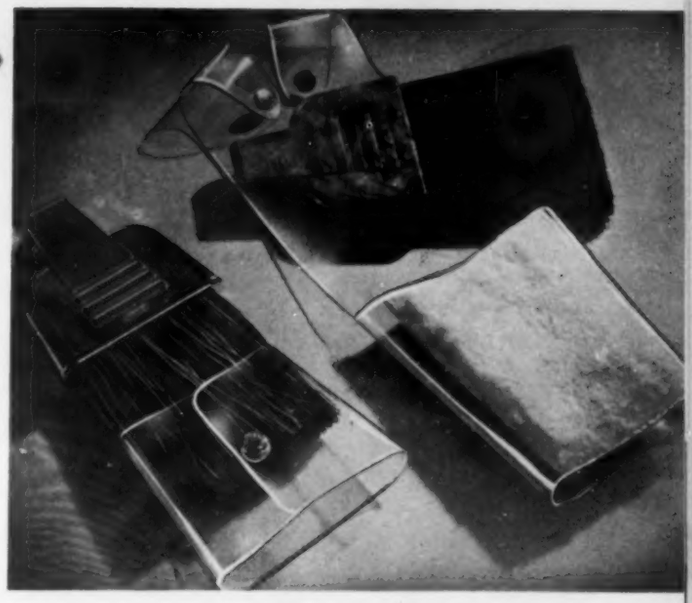
Spattering of oil and grease on yarn in weaving plants has been overcome by Celanese Corp. of America through use of Lumarith sheets as aprons on backs of looms. Material's transparency allows inspection of fabrics while on the loom



Products

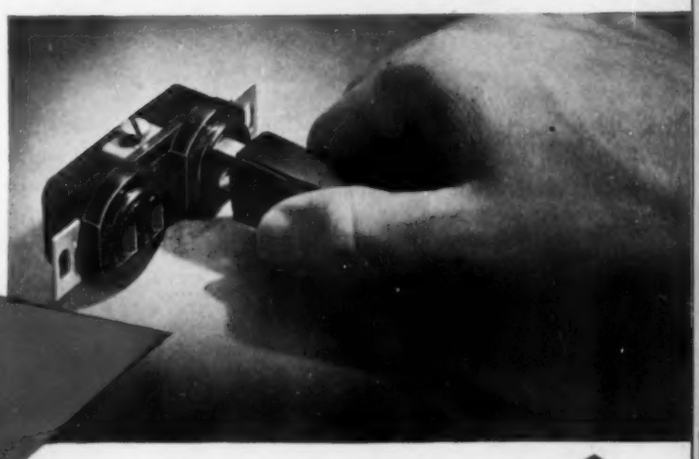


This polystyrene closure and new-type polyethylene liner have been developed for acid carboys by Owens-Illinois Glass Co. and vents at pressures not exceeding 10 p.s.i. Liner consists of eight radial spokes and hump in center which insures correct insertion of the liner. Unit has been used on sulfuric, hydrochloric, nitric acids, etc.



The plastic bristles in these Kippy-Kit Co. brushes produce, by friction of brushing, a static electricity that magnetizes dust and lint. They are easily cleaned with soap and warm water. Handles are molded of polystyrene by Columbus Plastic Products, Inc., and cases are Vinylite. The kit at right has Saran bristles made by National Plastic Products Co. Handle at left is gold metallized by Ano-Met Corp.; bristles are Pliofilm

Look once, then again at this Look Twice set consisting of an iridescent plastic ball container, a bottle of nail enamel and lipstick. This container is molded in two parts of polystyrene by the Sterling Plastics Co. for the La Cross Manicure Accessories Co. The top is cut out in a star shape so that the container may be reused on milady's dressing table as a cotton holder



Clever design prevents possible shock by insertion of such items as hairpins into holes in this new wall socket molded of Durez by Breyer Molding Co. for the Bell Electric Co. Pivoting plates cover holes when not in use

A ring for her finger can be fitted properly with this set of ring gages made by Lurite Corp. Parts are injection molded of Lumarith to tolerance of within $^{1}/_{1000}$ inch. They are lighter, cleaner, more compact than metal and rustproof

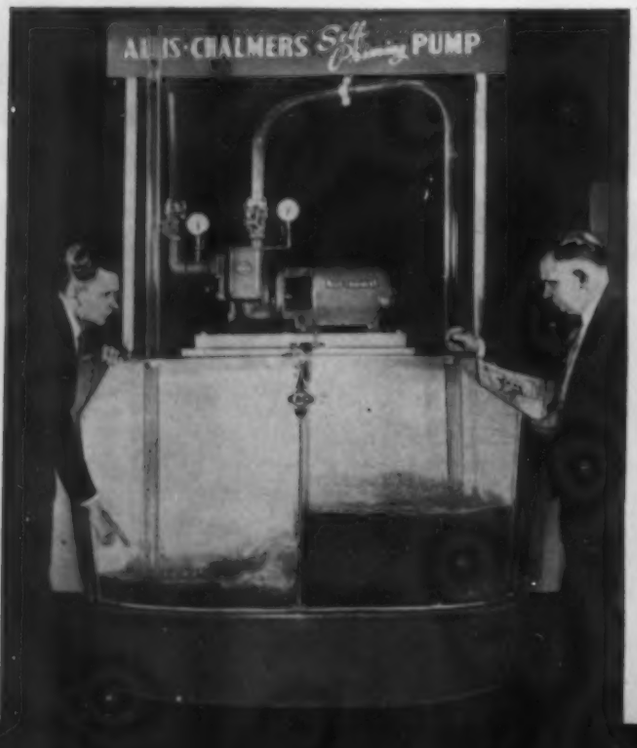
Pocket-sized ohmmeter put out by Radio Tube Div., Sylvania Electric Products, Inc., is inclosed in case of Tulox TT tubing, made by Extruded Plastics, Inc. Green housing cap and probe tip are molded of Bakelite by Radio Frequency Laboratories, Inc. Instrument can be used for checking electronic circuit components, etc.

Addresses of firms mentioned here may be found on page 244

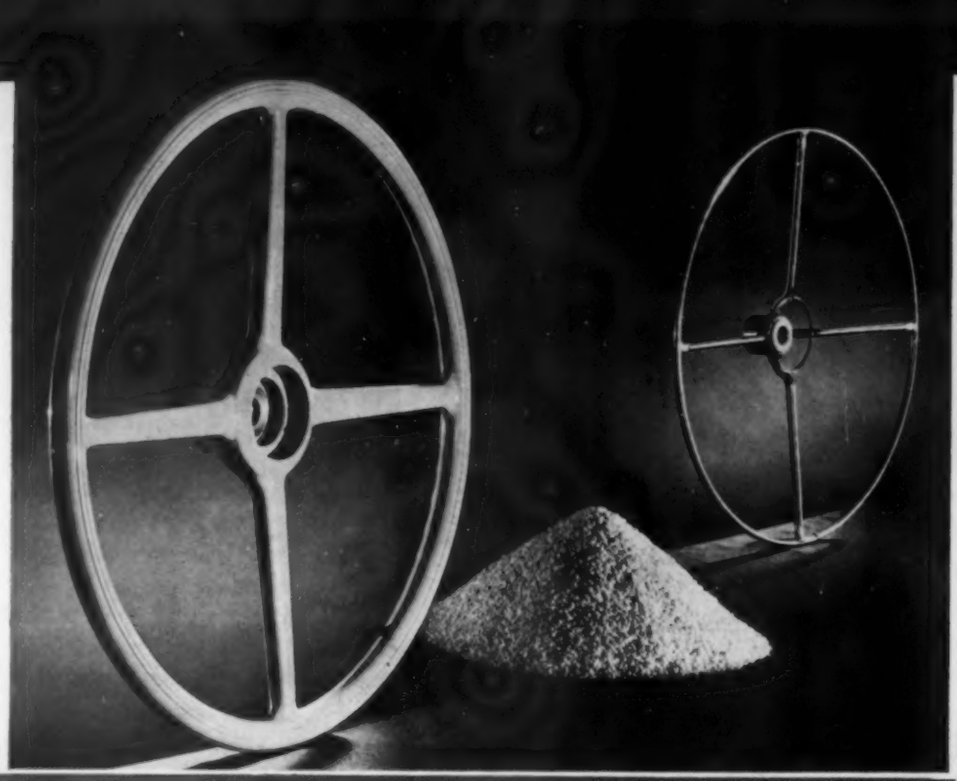
Plastics

You can create your own tunes by slipping metal clips in proper place on polystyrene wheels, injection molded in nine colors by H. Jamison for Create-A-Tune Co. The disk for turning wheels, setting clips is also molded of polystyrene. Each wheel has numbered slots and represents one of eight notes

Operating principle of Allis-Chalmers automatic self-priming pump is clearly demonstrated with this 80-gal. Plexiglas tank with Lucite tubing made by Midland Plastics, Inc. Tank is divided with gate in the partition, allowing tank to be drained, then fed again with water



Ease of cleaning, resistance to water and effects of shaving soaps, lotions and hair dressing materials led to selection of Vinylite for the interior of this new toilet kit for men. If contents are spilled, there is no danger of seepage destroying the kit's outward appearance. It is manufactured by Charles Doppelt & Co.

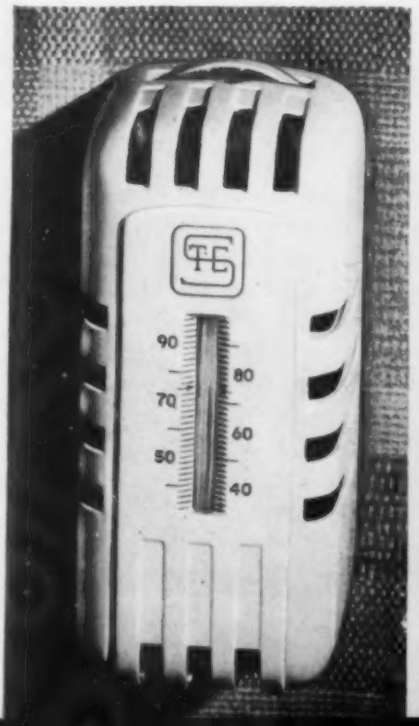


A steel insert and 5 lb. of Tenite II go into this 22-in. steering wheel for buses and trucks, injection molded by Sheller Mfg. Corp. Plastic was picked for its smooth surface; resistance to chipping, perspiration and grease

Products

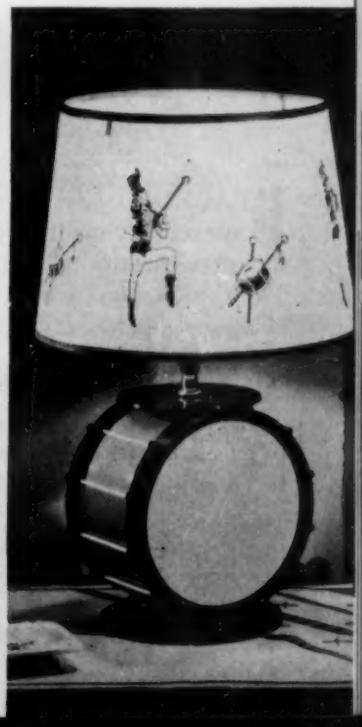
Designed for baby's comfort is this walker which can double as a stroller. The one-piece seat and back are compression molded of Tenite II by Victory Plastics Co. for the Thayer Co.

The light weight, dimensional stability and toughness of cellulose acetate led to its use in this thermostat housing molded by Elmer E. Mills Corp. for the Sampsel Time Control, Inc.



For decorative backgrounds is Scenichrome, a photographic transparency covered with Plexiglas. Sylvania Electric Products, Inc., makes cold-light fixtures for lighting back, sides. Design by Mrs. Erma Brenner

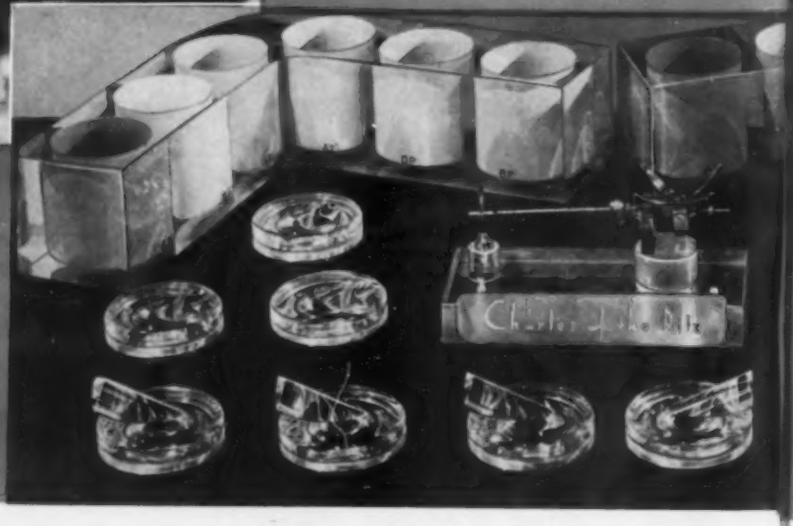
Boonton Molding Co. molds Lustron platform, rings, base and shell for Radio Frequency Laboratories, Inc. Acetate rods are by Gering Products, Inc., Head is Marcolite



FABRICATORS must be versatile

Peace brought a change of pace for fabricators. Here's one who discovered a key to successful reconversion

1—This drill is biting into acrylic slab to form powder display. In each cavity keyhole is drilled, too, to allow for cover fit



2—Finished product makes handsome display. Not only the jars but the covers and the scale base are fabricated of acrylic

PEACE BROUGHT a more exacting market, increased competition, and a host of production problems to the fabricators of acrylic products. The field became one in which careful planning, high efficiency and versatility were essential for survival.

Reconversion, change of pace

In many cases reconversion forced a complete change of pace. Shifts in the market and competition necessitated adjustments not only in selling but in the mode of operation, the equipment, even in space requirements in the factory.

An example of successful reconversion in this field is the Steiner Mfg. Co., 47-30 33rd St., Long Island City, N. Y., which fabricates any acrylic item from an earring display rack to an 8-ft. dome for a control tower.

In wartime, the Steiner Mfg. Co. concentrated on the fine precision work involved in military instrument parts. This made possible the production of goods of high value in small quantities, requiring relatively little factory space. In the peacetime market, the company combines a reliable stock-in-trade specialty with a diversified custom job shop. This requires the forming of large sheet parts in mass production quantities. To do the job and keep costs down, the company found it necessary to triple the production space.

New equipment had to be added, including one press 10 ft. wide and 7 ft. deep, and an oven, designed and built for the company, which will take the largest acrylic sheet made (67 by 79 in. or 53 by 85 in.).

The company found that it had to be ready to undertake the forming and sawing of sheets and blocks from 0.040 to 10 in. thick. The range of work involves anything from lathe-turning cavities of $^3/_{16}$-in. diameter to deep drawing up to 37 inches. Assembly operations may range from items with an over-all size of less than 1 in. to the stairway rails for a large modern building.

New line twice a year

The company's basic product is a proprietary line of display fixtures (Fig. 4). The acrylic material lends itself to effective, dramatic treatment; inexpensive tooling allows economical small runs in a large assortment of designs.

Semi-annually, the firm brings out a complete new line of display fixtures which are sold to department and retail stores for window and counter use. Best-selling fixtures in the old lines are continued as stock items. This display line accounts for 25 percent of the company's total business and enables it to operate at a more even rate of production than would be possible if it depended entirely on custom jobs.

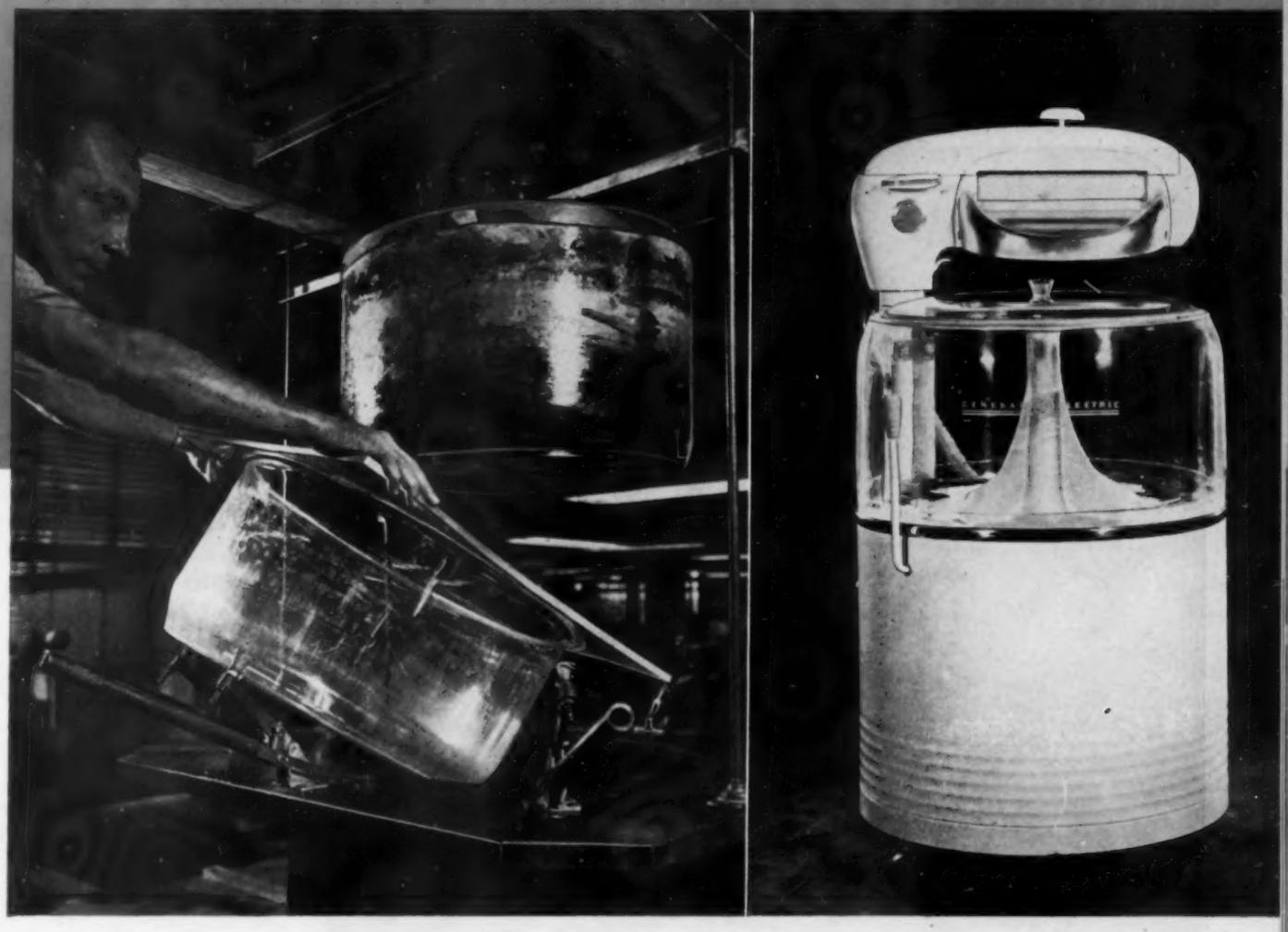
Custom work of all types

On a custom basis the company handles such varied work as industrial parts, machine housings, airplane parts, hospital aids, safety shields for factory machinery, streetlight luminaires, special protective devices for the food industry, and displays and signs for national advertisers. Orders range from thousands of pieces down to single items.

One of the most unusual of the company's custom jobs is the Charles of the Ritz cosmetic bar (Fig. 2), in which various shades of face powder are displayed for on-the-spot blending into a facial "cocktail." This display uses, for the first time, 4-in. thick specially cast Plexiglas blocks, free of bubbles and transparent.

The blocks are delivered in slab pieces, from each of which two U-shaped sections are routed and sawed. Holes are drilled to form the powder receptacles, which

3—Calling for expert forming technique was this order to reproduce in acrylic the metal tub of a washing machine. A 17-in. draw was required with no taper on sides. Acrylic sheets of varying thickness had to be used



are 3⅛ in. in diameter and 3½ in. deep (Fig. 1). At first, four drill operations were necessary. The holes could not be fly-cut because they do not go through. A special drill has now eliminated early operations.

A keyhole is also drilled in each cavity for the cover fit. Holes are then polished and painted inside with pastel shades to match the powder in each hole. Thus there is always an appearance of neat uniformity.

An interesting series of displays has been contracted for by the Cluett-Peabody Co., which believes in acrylic for effective, compact point-of-sale promotion. These displays are designed to make the best use of the limited amount of space available in those haberdashery shops through which their products are most widely distributed. Silk-screening is used for permanent copy, and provision is made for insertion of additional copy and price information.

Custom protective coverings for the food industry are also produced by the Steiner Mfg. Co. The possibility that pieces of glass or other foreign matter might drop into food mixtures is a constant menace. Among other safeguards, acrylic is used for huge canopies over conveyor belts to protect food from contamination.

Vacuum and air cylinders for drawing

For sheet molding, this fabricator uses a combination of vacuum and air cylinder plunger work. A piece could not be drawn deeper than the dimension of its diameter with the use of vacuum drawing alone. By mounting air cylinders above the work while it is being drawn into the vacuum, deeper draws are possible. This method also results in more even distribution and allows the forming of inside contours.

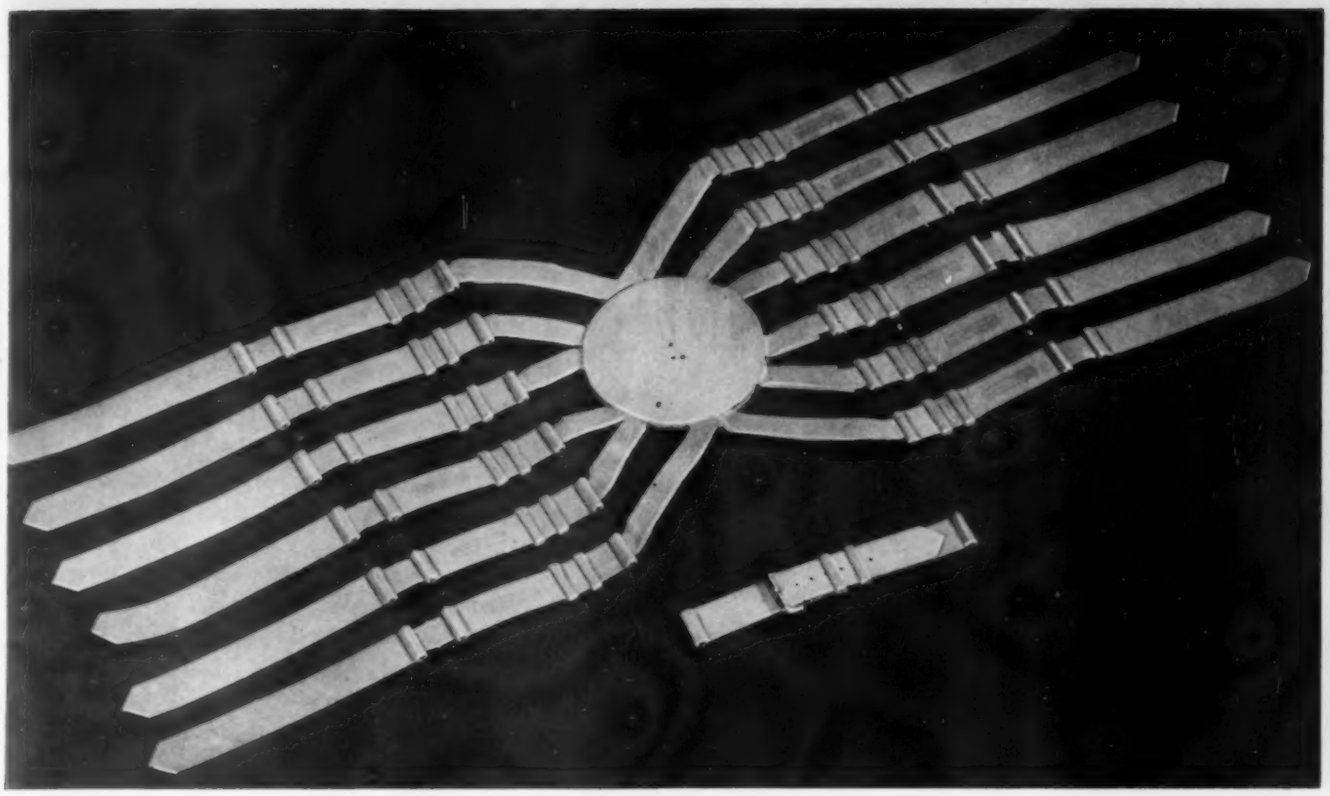
A recent example of the company's forming technique is an accurate acrylic replica of the metal tub of the General Electric Co.'s washing machine (Fig. 3). GE intends to supply them to appliance dealers to stimulate sales. The specifications called for a 17-in. draw with no taper on the sides, and the two parts of the tub had to be cemented at a point where they had been stretched. To get a uniform thickness at that point after an unequal amount of drawing, the two parts had to be formed from different thicknesses of acrylic sheet (Fig. 3).

Another Steiner product is the large Lucite top for a popcorn vending machine. Measuring 34 in. wide, 27 in. deep and 14 in. high, the top is said to be one of the largest single-piece, die-formed products ever made of Lucite, with the possible exception of some aircraft parts. It is designed to avoid sharp corners and flat surface, and to allow the popcorn to be seen.

Adaptability is the secret

The significance of the company's success lies not in any one technique of fabrication, nor in any one product. Its story and the story of all top-notch fabricators is that they are in business because they can turn out good items speedily and inexpensively, and above all because they can adapt themselves readily to the varied jobs in a far-ranging field.

4—Base product of this firm is a proprietary line of display fixtures. Acrylic is ideal for dramatic presentation, and inexpensive tooling permits small runs in a wide range of designs



Nylon has advantages for watch straps

IN AN effort to keep up with the consumer demands for plastic wrist watch straps, many companies are making straps in a variety of styles and materials. From the assortment available, it would seem that all demands have been met. However, after surveying the market, Ranger-Tennere, Inc., 318 E. 32nd St., New York City, found that sportsmen and laborers, in particular, have need for a strap that is strong, unaffected by perspiration and chemicals and one that is economical in price.

Anxious to capture its share of the watch strap market, the company set about finding a suitable plastic material. After extended research, FM4 nylon was chosen as the material that would best fill specifications. The use of this material made possible the molding of the two-piece strap in one operation—a factor which contributes to its low cost. Push pin holes for fastening watch and buckle, as well as the keepers for the strap end, are an integral part of the strap. Further economy is achieved due to the fact that scrap trimmed from the moldings can be re-used.

The strength and flexibility of the nylon strap is evidenced when it is subjected to pull of 42 lb. at which time it elongates to twice its original size without breaking. While this amount of pull is seldom if ever put on a watch strap, the degree of strength present does completely eliminate the possibility of the material tearing from one buckle hole to the next—a weak point in many straps. It is interesting to note that the nylon strap that has been stretched in the pull test will return to its original shape after 24 hours.

Design and molding facts

Imperviousness to rot, fungus and most chemicals has long been recognized as a property of nylon. The FM4 formulation is also non-toxic, non-irritating to the skin and will flex at extreme temperatures. Ranger-Tennere, Inc., has much reduced the annoyance of perspiration by surfacing the underside of the strap with the same pin-seal grain pattern used on the top side. This keeps the strap from lying flat on the wrist and allows some air to circulate underneath.

Twelve-cavity compression molding dies and special presses were designed by DeBell & Richardson, Inc., Springfield, Mass., for the job. The material flows into the molds at from 280 to 290° F. and after molding it is allowed to set from 48 to 72 hours. The holes for the buckle are punched on an automatic machine.

At present the Ranger-Tennere watch straps are sold through Woolworth and Montgomery-Ward outlets: It is available in four colors—black, gray, cordovan and pigskin—and in four widths—$^5/_8$, $^3/_4$, $^9/_{16}$, $^{11}/_{16}$ inches. All straps have pin-seal pattern and are equipped with metal buckles and spring-bar push pins.

Vinylidene chloride film and latex

ALL PHOTOS, COURTESY DOW CHEMICAL CO.

Packaging and coatings are the largest outlets for vinylidene chloride film and latex, the subjects of this third and final chapter on Saran

Vinylidene chloride's resistance to chemicals is put to use in the shipment of such materials as monochloracetic acid. Seamless tubes of this vinyl film have, in package at left, been cut to length and tied at the bottom. Placed inside the rigid container, tube is filled and tied at top

Saran film's chief outlet is packaging

SARAN Film 517 is a new product in only limited production, but those who have used it think it has a most promising future in the packaging field. A polyvinylidene chloride (available in continuous extruded rolls, 24 in. or less in width, and in three gages, 50, 100 and 200) it has characteristics such as chemical resistance, high strength, toughness, extremely low water-vapor transmission, heat sealability, good impedence to gases, and clarity that fit it particularly for packaging. Furthermore, that old bugaboo, unpleasant odor, is said to have been eliminated.

It remains more costly than several other common packaging films, but for the present, at least, its use will be confined to those fields where cost is not the controlling factor. If future developments bring widespread adoption of this film, it is assumed cost will drop.

One problem, particularly applicable to the packaging field and not yet completely overcome, is the difficulty of printing on Saran film. An experienced printer says that he has printed small quantities by both aniline and gravure processes but does not feel that they are proved commercial operations due to the inability to obtain perfect register. He expects to overcome this however.

The three gages in which film is available correspond to ½, 1, 2 mils. Thickness and tolerance limits are:

Gage	*Thickness, in.*	*Tolerance, in.*
50	0.0005	0.0004–0.0007
100	0.0010	0.0008–0.0012
200	0.0020	0.0017–0.0023

The producer declares that 50-gage Saran film has the same moisture-vapor resistance as some other 150-gage films. This quality suggests the use of Saran for all types of packaging wherein the retention of moisture or gas, or the exclusion thereof, is important.

As usual, Saran's chemical resistance, which approaches as close to universal repellance of chemical attack as any readily obtainable material, is a strong talking point for packaging, closure liners or gaskets. For packaging such difficult materials as acids, essential oils, drugs, cosmetics, pharmaceuticals and corrosive materials (many of which have been limited to glass in the past) it has great possibilities. Strong alkalies are an exception and are not recommended.

Specific applications upon which most emphasis has been placed to date are: a wrapper for cheddar cheese, a bottle-cap liner and a lamination to paper foil or other materials for packaging purposes.

The wrapper for natural cheddar cheese is being extensively tested in the market with the following results: Low moisture vapor transmission prevents dried-out surface flavor and rind formation, while low gas permeability prevents decomposition of the cheese. Saran's pliability, which permits folding and creasing without injury assures wrapper adherence, helps prevent air spaces, improves appearance and, since the film shrinks slightly upon aging, insures tight wrapping. No foreign flavor or odor has been found by cheese-tasting experts. Further, the film is unaffected by moisture or acids—moisture absorption of the film after

Mr. E. C. Emanuel of the Armstrong Cork Co. had this to say about Saran film as a liner:

His company, he said, has been working with Saran as a lining material since 1941, but was hampered by the war and the material's original taste and odor—since then largely eliminated. As a mounting on white sulfite paper it has not yet been thoroughly tested at full-scale production with the various backing materials for continuous production runs. As soon as this process has been perfected the liner must then withstand the test of going through lining machines where finished closures are produced. Experiments indicate satisfactory results may be expected, but "bugs" may still show up.

White sulfite paper has been used primarily as a liner backing in order to improve the appearance of the product. If attached directly to newspulp, pulp-board or cork, the transparent Saran would permit the adhesive to show through as well as the gray or brownish color of the backing. Used without a backing, Saran in a finished thickness of 0.045 to 0.050 would be costly and probably not sufficiently resilient for a liner.

Mr. Emanuel expects no trouble in adhering the film to white sulfite paper; their laboratory tests report unusual resistance to the passage of moisture vapor and excellent chemical resistance. Certain organic solvents such as acetone, toluol, chloroform and carbon tetrachloride affect it adversely, though many of the standard liners that are now in use are attacked to a greater degree.

one week's immersion being less than $^1/_{16}$ percent. If moisture penetrates into the cheese, a musty flavor is generated. Finally, transparency makes for eye-appeal.

Liners for caps and closures

Several companies are experimenting with Saran Film 517 for cap or closure liners. None of them are willing to admit that it will soon be adopted universally for the job, nor that experience is yet great enough to indicate marked superiority over other materials. But they do report that it is a remarkable product with great possibilities. There are some who complain about the cost in comparison to other cap liners, but processing to obtain the needed air tightness, moisture and chemical resistance is not simple. Nearly all closures require some kind of a liner; most users agree that the effectiveness of the closure depends materially upon the quality of the liner facing.

To the uninitiated it may seem strange that manufacturers should scramble to capture a portion of the cap liner market, an impression that is quickly dispelled when the size of the field is brought out. Narrow neck glass containers alone are produced at the rate of approximately 80,000,000 gross a year. Each requires a cap or crown, and most of them use some kind of liner.

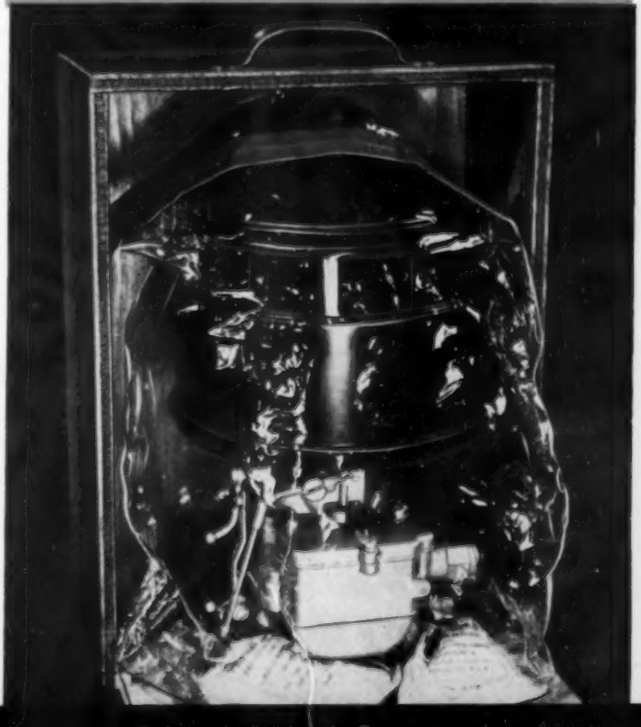
Several types of plastics and kindred materials are now in the liner field. At present Saran is being pointed particularly at the drug, chemical and cosmetic field, but developers are hopeful that producers of quality liners for all uses will eventually turn to this plastic.

Such things as mayonnaise, mustard, pickles and olives, which may have either large- or small-diameter caps, use varnished paper backed with newspulp for liners. White wax paper is used for other items. Vinyl plastics and Pliofilm have frequently been used because of their freedom from taste and odor, low moisture vapor transmission and sealability. Developers claim that it is possible to use Saran in the cap lining of all these products now that odor has been removed Such wide-scale adoption of Saran, it is believed, would lower the cost which is now approximately 15 to 20 percent higher than for vinyl plastic liners.

Saran Film 517 also has a promising future as a laminate, largely in the packaging field. It may be readily laminated, by an adhesive rather than a heat process, to aluminum or tin foil, Pliofilm or other transparent plastic sheeting.

The claimed advantage of a laminating over a coating method for packaging is that a laminate gives a uniform, homogenous and continuous film with less liability of pinholes and no chance for stray fibers to

Polyvinylidene chloride acts as moistureproof barrier in the dehydrated packaging of machines



In latex form, this plastic makes a good protective wall covering in humid and corrosive atmospheres

give wickage through which contents may pass. Laminated structures with a Saran surface can be used on standard heat-sealing equipment because the lamination restrains any possible shrinkage. Foil wrappers, generally used to shut out light, are usually coated or laminated for heat-sealing and Saran film can be used.

Among the specialty items recommended for laminates using Saran Film 517 are dehydrated food packages such as soup and concentrated dinners where this plastic would be particularly adept in keeping out moisture. Sealed overwraps for such things as dried fruits are another outlet. Frozen food packaging is a possible market because of the film's low temperature flexibility and good cling.

One of the newest and most intriguing outlets promises to be the use of this Saran film laminate as the complete container for individual single dosages of such hygroscopic materials as hair oil, Bromo Seltzer, yeast, bouillon, instant coffee. If the idea takes hold, Saran could become the standard packaging material.

Broader outlets hinge on supply

As the foregoing discussion indicates, Saran Film 517 is at present being directed almost entirely to food packaging. In fact, exploitation of the material, which is an extruded and oriented sheet (quite different from a cast film), is not on a large scale at present because of a shortage of processing equipment. Further, there are still certain limitations that discourage its entrance into certain fields. For example, it is not yet recommended for closet accessories because of shrinkage and a tendency to tear after puncture, which prevents sewing.

Saran latex

Latices are not yet widely used in the plastics industry, though the time probably is coming when their use as a coating medium will become commonplace. It is significant that recent developments in the coatings field tend toward the use of synthetic latices and dispersions. Also significant is the circumstance that rubber latex was being shipped to this country in ever-increasing quantities before the war because of its ease in handling and processing.

The latex as a coating

Latex is simply a dispersion of a finely particled resin in water. In a Saran dispersion the solid content is about 56 percent. Latices' viscosity may be readily adjusted over a wide range permitting their use with any of the more common coating methods including roller, doctor blade and spray types. Likewise, low viscosity dispersions of high solids content are satisfactory for saturating, impregnating and adhesive purposes. They can be used as protective and decorative coatings for wood, metal, paper, cloth and leather.

The Saran latex coatings are easily dried; no baking is required. The user evaporates the water in drying equipment, which may be oven, tower or other method, and the resin adheres to the item to be coated in a continuous film. The process cuts costs and eliminates the toxicity and fire hazards of the solvent system.

The latex need not be confined to the coating field. Such properties as wet strength; oil, grease and chemical resistance; vapor permeability and tear resistance may be improved by incorporation of latex in fiber furnish or its use on impregnating machines.

As with other types of Saran, caution should be used in choosing metal equipment to handle the latex. Process equipment containing black iron, mild steel and zinc are not recommended due to their precipitating action. Suitable metals, in order of preference, include stainless steel, chromium, tin, aluminum, copper, bronze, brass and nickel. Iron and steel surfaces are satisfactory if previously coated with a water-impermeable finish. Other satisfactory construction materials are wood, glass and tile.

The addition of at least 15 percent of plasticizer is necessary in order to deposit a clear, tough, continuous film without the need for heat treatment. The latex, as sold, includes dibutyl phthalate, the plasticizer. Films containing 15 percent or less of plasticizer will show improved physical properties if heated for a few minutes at 210 to 230° F.; aged films containing more plasticizer are not appreciably improved by heating except that it will reduce the time necessary to reach optimum physical properties. The plasticizer serves to coalesce and fuse the minute resin particles into a continuous impervious film.

The thermoplastic properties of Saran F-122 copolymer contribute good heat-sealing characteristics to latex films. The standard heat-sealing machines of the trade, including rotary, jaw and continuous belt types, are all reported satisfactory. The general sealing temperature is between 205 to 270° F. for approximately $^1/_2$ second. Lower temperatures are feasible when plasticizer content is above 25 percent. Paper coatings, heat-sealed to themselves (face to face), form an exceptionally strong seal. When it is desirable to heat-seal the coated side to the back side, a better bond is achieved if a light latex sizing treatment is applied to the uncoated surface. This sizing provides an anchor

coat to which the primary latex coating can securely weld itself under heat and pressure.

Latex makes good adhesives

The stability and high solids content of Saran latex compositions make them useful as binding agents and adhesives. The incorporation of specific plasticizers and other modifying agents produces fast-setting synthetic adhesives having unusual resistance to water. These adhesives likewise possess excellent flexibility, oil and chemical resistance. They can be compounded for application by brush, roll, spray and spread coating methods to a variety of materials.

Treating leather with latex

When applied to leather, Saran latex provides a tough, protective coating useful in improving resistance to water, moisture vapor, grease, chemicals and to permeation by gases. It is also of value as a light sealer coat to minimize penetration of lacquers during their application. Latex can be formulated to provide abrasion resistance for leather coatings and improved crack resistance for pigmented coatings.

Latex paints

Water paints prepared from Saran latex have created interest as corrosion-resistant coatings on metal, wood and fiberboard. These clear or colored paints can be sprayed or brushed and dry quickly.

Paints based on Saran latex have found many uses in the maintenance field where coating conditions are difficult, as on wet concrete; where humidity is high: where odor of solvents is objectionable as in bakeries, breweries and laundries; where corrosive fumes or liquids are present.

Latex coating for fabric and yarns

Fabrics coated with this material are particularly suitable for industrial use where general chemical resistance and durability are important. Duck may be made resistant to water, oils, greases, gasoline, acids and alkalies for use in aprons, gloves, tarpaulins, protective clothing and conveyor belts. Jute, burlap and other coarse fibers may be given similar protection. Since these coatings will not support combustion, resistance to burning is improved. The high impermeability of the latex film suggests usefulness in the manufacture of gasproof fabrics and similar materials.

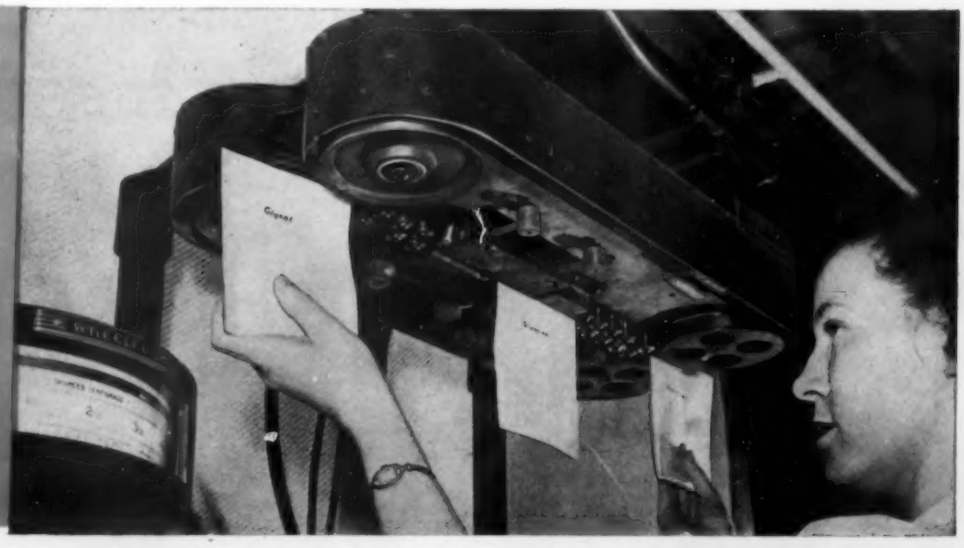
Yarns and threads coated with this latex are made waterproof and resistant to picking and linting. The latex is also useful as a back sizing for pile fabrics and as a binder for rugs and carded unloomed fibers.

Paper coating the largest latex outlet

Probably the most widespread use of Saran latex at present is for coating paper and paperboard. Application of the latex is usually carried out as a converting operation by spray, roller or spread coating methods. It has been found that coatings approximately $^1/_2$ mil thick will, in general, be sufficient.

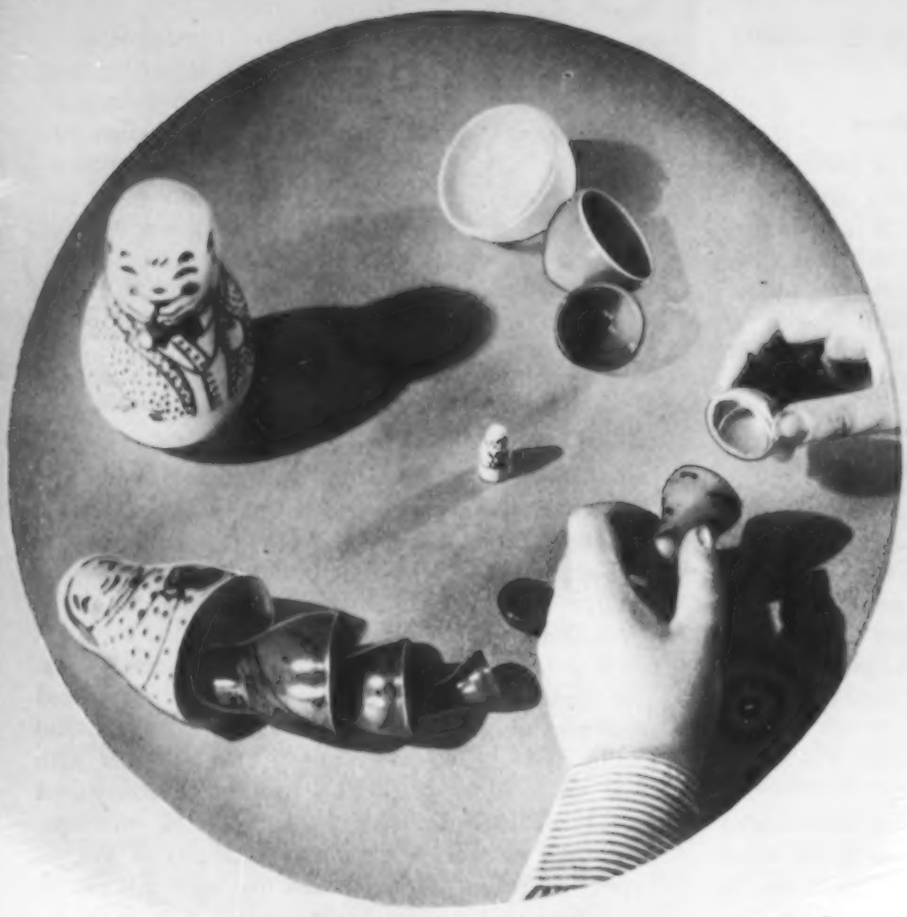
These coatings are particularly applicable for greaseproofing on various types of paper and paperboards. The good mechanical properties of the plasticized films provide a flexible barrier which will withstand folding and scoring operations. This, together with their heat-sealing properties, provides a convenient means of fabricating hermetically sealed envelope-type bags for packaging greasy products of various types. Corrosive chemicals and like materials can be safely packaged in a similar manner.

The waterproof nature of the dried latex coating is useful for protecting shipping containers, gummed tape backings and specialty products. The strength and durability of paper twine and fiber cord is increased by a coating of plastic film. Woven paper cord thus treated is easier to clean and more resistant to soiling. Molded pulp articles are also easily coated with this latex to provide a tough, attractive, durable surfacing. Fiber pails may be conveniently waterproofed and greaseproofed by spray or slush coating. Fiber wallboard protected with Saran latex is washable and moisture vapor resistant.



Paper that is coated with vinylidene latex is adapted for use in heat sealed packages. They are prepared here on continuous belt sealer

Nested dolls



The 13 parts of this new toy are molded of polystyrene to form seven dolls which nest inside one another to amuse and to instruct the child

LIKE CUCKOO clocks and Chinese lanterns, certain toys "native" to various foreign countries have been loved by many generations of American children. Such a toy was the hand-tooled, hand-painted set of wooden nested dolls. Historically a product of old Russia, each of these two-piece wooden dolls had to be hollowed out individually. This was a time-consuming and expensive operation since it was necessary not only to fit the two parts of a doll exactly but to make dolls to dimensions that would permit the nesting of the family of figures. Then there was the hand decorating which had disadvantages of extra cost and impermanence under repeated handling.

Old product in new dress

When modern industry went about making this toy on a mass production basis, the prime problem was to select material that could be formed repeatedly, that would enable the product to be made at low cost and that would be at least as light as wood. To be suitable

A counter display shows prospective buyers the main feature of the toy, which the compact package hides

Master templates were made, when cavities were turned on this machine, to insure uniformity of duplicate molds

are now molded

Lower cost, integral color are advantages of polystyrene over wooden toys

material for a toy to be handled by children, it would also have to be permanently colorful.

Jonthay, Inc., 166 Duane St., New York City, chose polystyrene as the material and injection molding as a method of production.

The seven members of the family are all club-shaped, but each is a different size and color. Each doll consists of two parts, with the exception of the smallest one which is a single piece. Putting the dolls together and putting them inside one another teaches a child to recognize differences in color and size. It also gives him practice in muscular coordination. Incidentally, the two parts of each doll are molded to close tolerances and therefore fit together so tightly that the dolls can also be used as floating toys. Their ability to float in the bathtub or wading pool considerably broadens the age group to which these colorful toys will appeal.

Whole set in one shot

The dolls are molded by Beacon Plastic & Metal Products, Inc., 280 Madison Ave., New York City. One 13-cavity mold is used, producing a complete set of seven variously sized dolls in each 45-sec. cycle. In order to get a variety of colors in each set, dolls from different sprues are combined to form the sets which are packaged for sale. Six different colors are used.

The mold cavities were turned on two types of engine lathes made by Monarch Machine Tool Co., Sidney, Ohio. Total machining time for all cavities was 52 hours. Master sets of templates were made so that duplicate cavities could be turned out if additional molds were required. This method of allowing for the duplication of a mold assures the uniformity which is achieved by hobbing, but is rarely accomplished by lathe turning methods.

Printing and packaging

The printing which gives the dolls their distinctive appearances is done by Verne-Gilbert, Inc., 523 W. 45th St., New York City, which has developed a special setup for roller offset printing on odd-shaped items.

Each set of dolls is packaged in a sturdy, attractively colored tubular carton, with the dolls nested. While this arrangement is convenient for shipping, Jonthay felt that it might retard sales because a casual observer might not notice the main feature of the toy—the nesting of the figures.

Display essential to sales

To overcome this, the company has developed a display which it furnishes to retailers with each carton of three dozen families. The display shows the seven dolls lined up separately. It also emphasizes their "nesting" with a picture of the dolls coming apart and the words, "plastic nested dolls" and "7 dolls in 1".

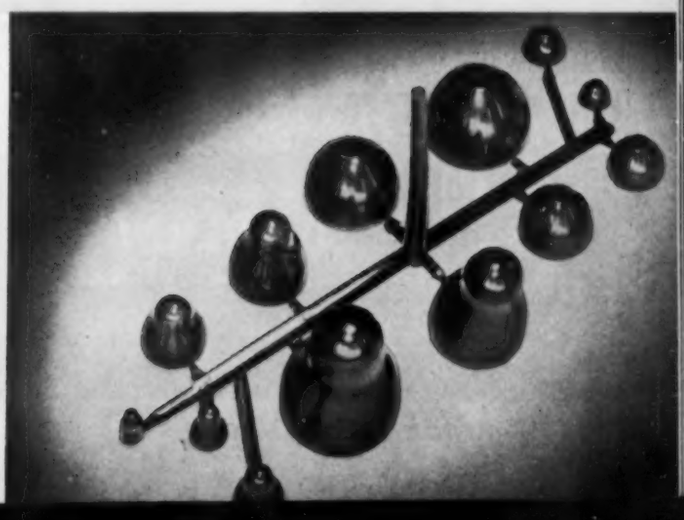
Jonthay, Inc., feels so strongly that the display is needed to tell prospective purchasers about the toy that it discourages stores from buying it at all if they do not intend to use the counter display. How well the display does emphasize the unique features of these toys is evident in picture at bottom of opposite page.

Perhaps the most significant part of this production story is the use of the master templates, mentioned above, as devised by Beacon. Since it could be carried into the manufacture of molds for a series of packages in one design, for gadgets in the same shape but different sizes, this technique is worthy of note.

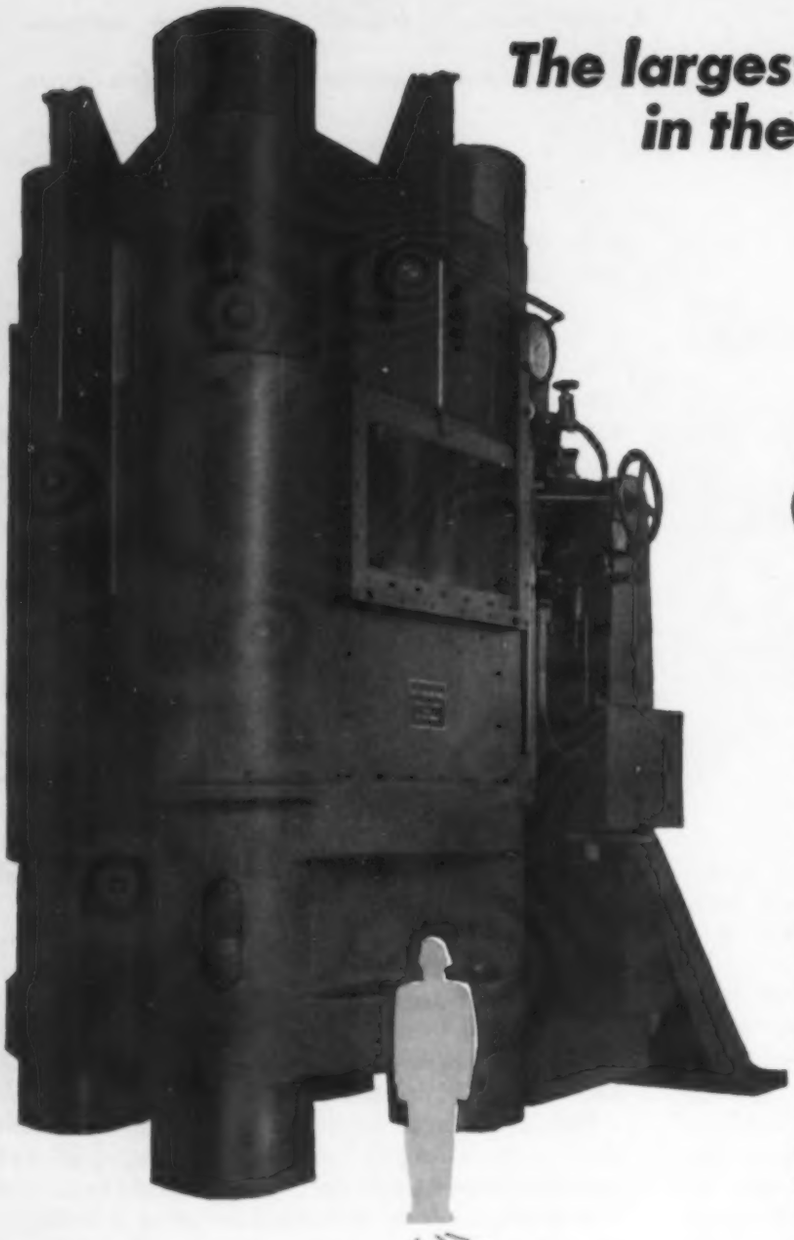
Total machining time of only 52 hours was necessary to turn the cavities and plugs in this mold for the dolls

Each shot produces a seven-doll set, but dolls from different sprues are mixed for vari-colored sets

PHOTOS, COURTESY MONARCH MACHINE TOOL CO.



The largest hobbing press in the plastics industry



Hobbed Cavities *by* Midland . . .

An important addition to Midland's expanding facilities is this 8000 ton hobbing press, the largest of its kind in the plastics industry.

This mammoth press with a ram diameter of 39½ inches makes it possible for Midland to hob cavities of approximately 80 square inches . . . almost tripling former hobbing limits.

With this press, Midland is prepared to supply plastic molders with hobbed cavities for large plastic parts including radio cabinets, large container escutcheons and instrument housings. Multiple cavities can be hobbed . . ."like peas in a pod". . . quickly, with complete uniformity and accuracy. Multiple cavities will speed up your production with a minimum of expense.

Midland experience and facilities, in addition to skilled craftsmen, are ready to serve you . . . to produce the finest and deliver on time when you specify "Hobbed Cavities by Midland."

Write for your copy of "How to Heat Treat Hobbed Cavities," a practical heat treating treatise to help you get the best performance from Hobbed Cavities by Midland.

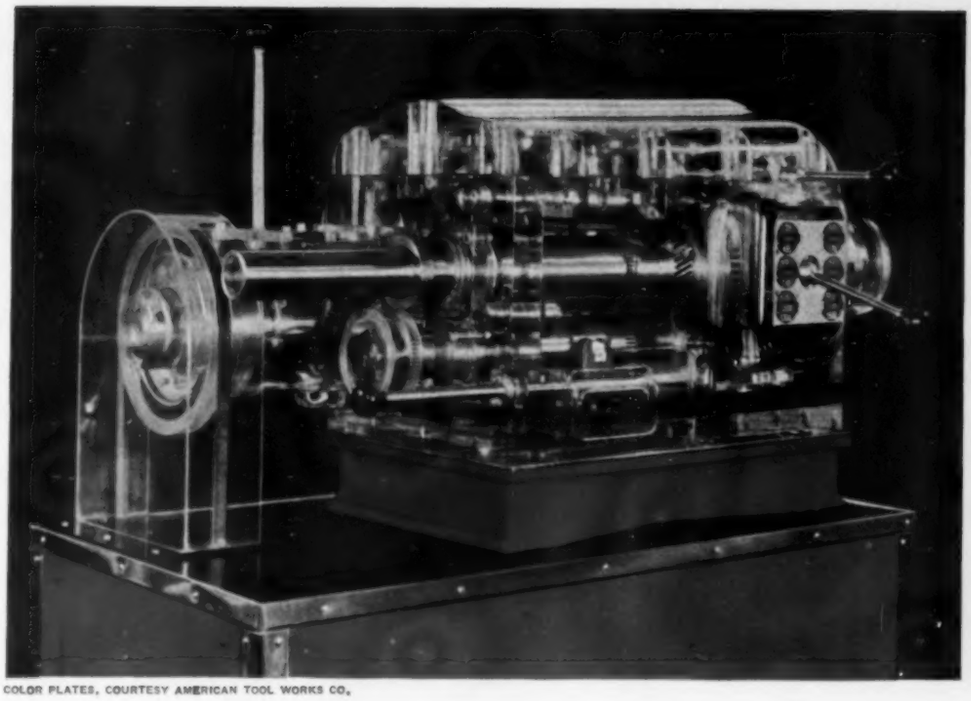
Cavities for: Radio Cabinets — Escutcheons — Instrument Housings

D&E

MIDLAND DIE AND ENGRAVING COMPANY

1800 W. BERENICE AVENUE . . . CHICAGO, ILLINOIS

Makers of Plastic Molds ★ Die Cast Molds ★ Engraved Dies ★ Steel Stampings ★ Hobbings ★ Pantograph Engraving



COLOR PLATES, COURTESY AMERICAN TOOL WORKS CO.

This full-scale model lathe may be seen in action thanks to the use of twelve acrylic and cellulose acetate butyrate parts. Laminated acrylic sheets were used for lathe head and clutch housings; a single sheet forms lathe head cover. Shifter brackets, bearing covers, the pulley and the spindle nose are machined from cast and laminated stock

Transparent plastic puts lathe on view

A BRIEF GLANCE at the above photograph shows the advantage of using transparent plastic as a housing for the display model of a new machine, for no other material combines so well an over-all attractiveness with a clear view of the internal parts. But nothing short of a moving picture would demonstrate the special value of this exhibit model of the Pacemaker lathe, manufactured by the American Tool Works Co., Cincinnati, Ohio. This is a full-scale working model and the dozen plastic parts must match the original metal parts in dimensional precision and also must have the strength to meet the demands of lathe operation in a working demonstration unit.

The contribution of plastics to this model includes a complex housing of laminated methyl methacrylate for the lathe head; a similar housing for the clutch; a single sheet of the same material vacuum formed for the lathe head cover; two shifter brackets, four bearing covers, a pulley and a spindle nose, all machined from cast or laminated acrylic stock; and oil tubing of transparent cellulose acetate butyrate.

Some conception of the problems involved in the production of the plastic parts for this model may be gleaned from the fact that some parts had to be as much as 3 in. thick without loss of optical clarity and that the head design calls for the precision drilling of 125 holes. Despite the complexities and difficulties of fabrication, it was necessary to use transparent materials for all these parts in order to show all the important design features of the lathe. Company engineers wanted customers to see the sliding gears, cam actuated by two levers to obtain a smooth simple change of 27 speeds, and the patented spindle bearing adjustment device which permits adjustment of roller spindle bearings, without removing lathe head cover.

A transparent plastic casting is ideal for illustrating how an oiling system works. It is not too easy to

* Reg. U. S. patent office.

draw pictures of lubricating oil and how it is cascaded. For this purpose a light oil was dyed blue, and transparent butyrate tubing was used for piping. The blue oil is piped from a pump directly to a Cuno oil filter, then up to the top of the head and into reservoirs cut into the gear shifter brackets. Therefore, to show the oiling system properly, it was necessary to make plastic gear shifter brackets. These brackets hold the shifting cams and levers and must withstand quite a large force during the shifting operation. From these reservoirs in the shifter brackets, clean filtered oil is piped to each individual bearing and then cascaded over the gear teeth.

The transparent lathe head was assembled with standard gears, bearings and spindle together with all moving parts to show the workmanship of the lathe. No moving part was retouched for this model. About 800 lb. of metal parts were needed.

This model of a 14-in. lathe head is 25 by 17 by 15 in. without the cover and clutch housing. Some sections are 3 in. thick, laminated from 12-in. sheets of Lucite or Plexiglas. All housings were laminated from sheet because the wall sections had to be optically clear on the inside of the model as well as on the outside.

Problem of air bubbles

To laminate 26 by 18-in. sheets $1/2$ in. thick so they are free of air bubbles was quite a problem. A fixture was made containing 64 screws evenly spaced over an area of 28 by 20 inches. Sheets, cut to the proper size and shape to give the particular wall contour desired, were soaked in solvent for 3 to 5 minutes. Special stainless steel pans were necessary to soak one side of a sheet without getting solvent on the opposite side. After the sheets were properly softened with solvent, they were placed in the fixture and the screws closest to the center of the sheet tightened to force the air bubble toward the edge of the stack. Bubbles would appear from nowhere and would travel in the wrong direction. They would materialize after the stack seemed perfectly clear and would grow in size. At no time could very much pressure be applied on any one screw without causing bubbles around other screws.

After several experimental trials the man operating the cementing fixture became very proficient in chasing bubbles and acquiring the proper viscosity between the sheets so that the mixture would not start to set before all bubbles were removed. The fixture was designed so that the operator could see every part of the sheet.

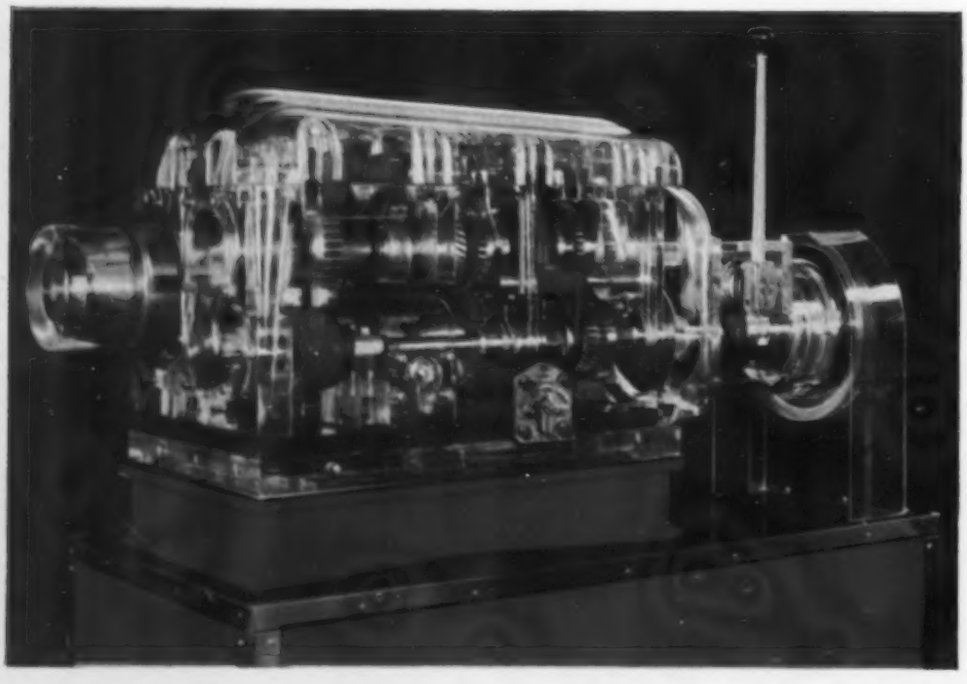
In using $1/2$-in. sheets, it was necessary to laminate as many as six sheets together to achieve a final dimension of 3 inches. Two sheets were laminated at a time and checked for thickness. These two would then be laminated to a third and again checked. This procedure was followed until the proper thickness was acquired. It was necessary to use comparatively thin sheets to build up a thick wall section in order to follow the inside contour of the Pacemaker casting.

Three weeks' curing before machining

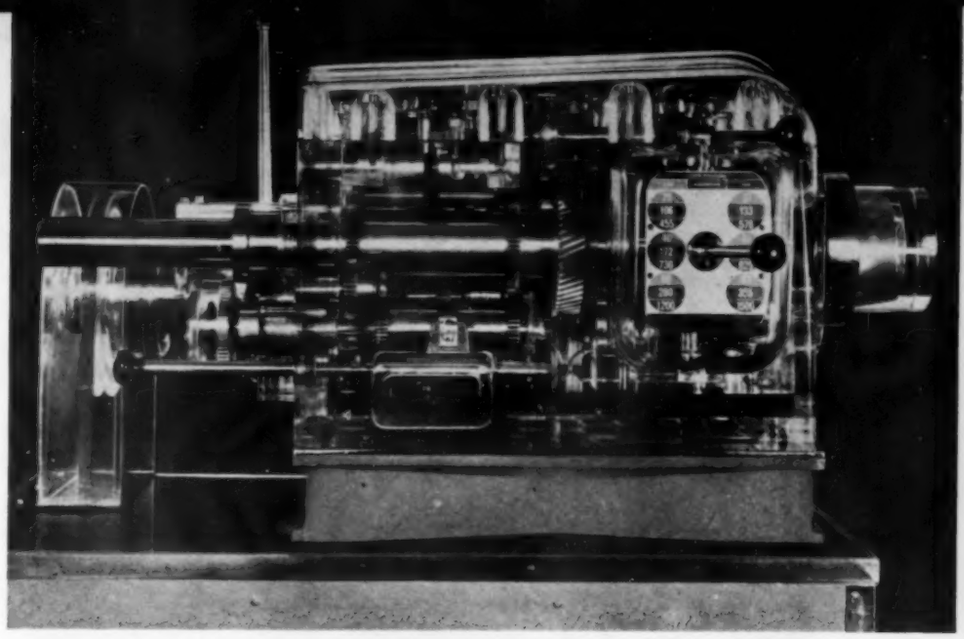
It required at least three weeks' curing or setting time before these laminated stacks could be machined successfully. If they were machined too soon, the material that had been softened would shrink back leaving sunken lines along the edges of the stack.

After the bottom, four side walls and two internal ribs or cross members were properly cured they were all machined to the proper width and length.

Holes had to be bored, with diameters of 2 to over 5 in., through two walls and two ribs. And their spacing had to be held to within 0.001 inch. Approximately 125 holes were drilled or bored in this lathe head hous-



To demonstrate workings of the oiling system, light oil was dyed blue and piped through transparent butyrate tubing. Oil is pumped into reservoirs in gear shifter brackets. Therefore, those parts had to be transparent



Production was complicated because some of the parts had to be 3 in. thick and still be optically clear. The head design called for precision drilling of 125 holes

ing, justifying the careful attention to thickness of the casting and curing time.

Assembly of head model parts

It was necessary to cement the four side walls, the bottom and two ribs in position and still obtain a fairly accurate wall spacing dimension. This seemed to be quite a problem since it was decided not to machine inside wall surfaces after assembly, but with the knowledge gained in laminating sheets to specified thicknesses, it was comparatively easy to soften edges properly and control dimensions with pressure.

The precision ball bearings used on the spindle and all driving shafts were mounted directly into the plastic housing. The bored holes for bearings, shafts or screws were not polished since it was necessary to maintain very accurate dimensions for mounting bearings. These bored holes, oiled during assembly, give the appearance of being polished.

The clutch housing, 12 by 7 1/2 by 10 in., was made in exactly the same manner as the head model. This clutch housing was screwed to the main casting before final machining on either part. The two large shifter brackets, four bearing covers, a pulley and the spindle nose were all machined from cast or laminated stock.

After the final machining operations, the head and clutch assembly was allowed to stand for four weeks and all bore diameters and bore spacings checked to determine if the plastic had crept or shrunk after removing so much material. The dimensions were intact and the metal parts were assembled in place.

The formed cover was made an exact copy of the streamlined Pacemaker cover by a Hydrocal casting directly from a cast iron part. A Plexiglas sheet, 1/4 in. thick, was heated in an oven and then sucked into the Hydrocal mold by vacuum. Trimmed and with its supporting lugs cemented in place, it was ready to be machined.

A Tygon gasket was used between cover and casting to render the workings completely visible.

THE PROBLEM: A PRESS OPERATION calling for a flow of 124 gal. per min. at a pressure of 2000 p.s.i.

The solution: a new Hi-Lo power pack especially designed for the Norton Co., 1 New Bond St., Worcester 6, Mass., by Greer Hydraulics, Inc., 454 18th St., Brooklyn, N. Y., for actuating huge presses.

Normally, to meet the above demand, 145 hp. and a large volume high pressure pump would be required. However, by incorporating five 10-gal. accumulators in the circuit, Greer Hydraulics was able to reduce the size of the motor to 30 hp. with a great saving in cost of installation and upkeep. An intermittent duty type circuit was used.

The unit consists of an all-steel cabinet, housing all circuit components. The hydraulic circuit is powered by a dual-shaft, 30-hp. electric motor, one end of which drives a low pressure pump capable of delivering 9 gal. of fluid every 15 sec.; the other end drives a high pressure pump with a capacity of 3 gal. every 15 seconds. The low pressure fluid is stored in three accumulators which operate between 300 and 200 p.s.i. The high pressure fluid is stored in two accumulators which operate between 2500 and 2000 p.s.i.

Edge glued

PHOTOS, COURTESY GAMBLE BROTHERS (INC.)

1—This close-up of infeed end of the machine shows compression rollers that uniformly press the various pieces to be edge-glued to the bed of the machine as pieces feed into the machine

FOR MANY years, edge gluing of lumber has been a bottleneck in straight-line production in the woodworking industries. While mechanization invaded other phases of these industries, no machine could be perfected to replace completely all the work common in edge gluing.

Gamble Brothers, Inc., Louisville 9, Ky., believes it has found the solution in its new Diehl-Dosker edge gluing machine which will handle a production of 1000 ft. and upwards per hour in widths up to 37 inches. Thermex high frequency equipment assures fast setting of the glue, and practically any of the commercial urea formaldehyde resins may be used for binding.

These include: Uformite 500, Uformite 430, Catalyst Q 92, Casco 5, Catalyst M 40, Cascomite 12, Lauxite 87 RF, Urac 185 and Plaskon 250-2. Use of phenolic-type adhesives with this equipment has not proved feasible to date because of their tendency to arc in curing, though it is believed this will be overcome.

In developing this new machine, traditional thinking was forgotten, past equipment and efforts were abandoned, and a new and technical approach undertaken.

First, it was determined that uniformity in the thickness of the stock was important, especially as it affected subsequent machine operations. This meant that the rough lumber should be surfaced either before cross-cutting or after cross-cutting, and the advantages from a cost standpoint favored surfacing before cross-cutting. Rough surfaced lumber was divided into two groups—the group which was fairly uniform in thickness and the group that was scant in thickness. These had to be handled separately in gluing.

Second, lumber prepared for edge gluing was studied in the light of what could be expected in the machine operations of ripping and jointing from conventional equipment uniformly in use. Flat lumber presented no problem, but lumber containing seasoning defects such as warp and twist, presented a different story.

Sap gum, black gum and short leaf pine in the lower grades commonly used for core stock showed a great tendency to warp and twist. When these boards were passed through a straight line rip saw, or through a jointer, the sawed or jointed edge was not in a continuous plane but varied from the perpendicular depending upon the amount of pressure applied as the stock passed through the saw or over the cutter head. It was found that none of the conventional sawing or jointing equipment could apply enough pressure under normal conditions to produce joints entirely in a continuous plane.

The nearest approach to truly plane joints for edge gluing could be obtained only on such machines as molders, matchers or floor machines in which rigid top pressure could be applied to hold the stock fast to the bed of the machine as it passed the cutter heads. As this prevented the use of random width stock, it was impractical as a general manufacturing procedure.

by machine

A thousand feet of lumber can now be edge-glued in an hour, making use of urea resins

Warped or twisted stock passing through a rip saw or glue jointer developed a rocking action on the chain.

Third, a study of machining operations was undertaken. Strips with concave or convex joints had a tendency to build stresses into finished panels, causing warpage or twisting. The best panels were produced by uniformly straight edges in adjoining strips.

Fourth and most important was the consideration of proper pressure. Pressures as low as 10 to 15 p.s.i. were found adequate in producing good glue joints, giving 100 percent wood failure. However, the average experienced operator applied between 500 and 800 lb. total pressure per clamp with an average of 638 pounds. On 1-in. lumber, this meant varying pressure per sq. in. of 64 lb. maximum to 40 lb. minimum.

In actual application of pressure, two methods were found best. One was to apply pressure progressively from one end of the panel to the other. The second was to apply pressure from the center and work out.

From the four-point analysis given above, company officials decided the new machine had to provide:

1. Progressive application of pressure sidewise.
2. Rigid downward pressure to press the bowed and twisted pieces flat to the clamp bed immediately prior to the point of application of edge pressure, but to remove this pressure to permit adjustment of the edges of the pieces to the plane of the adjacent piece.
3. Continuous pressure during curing or setting.

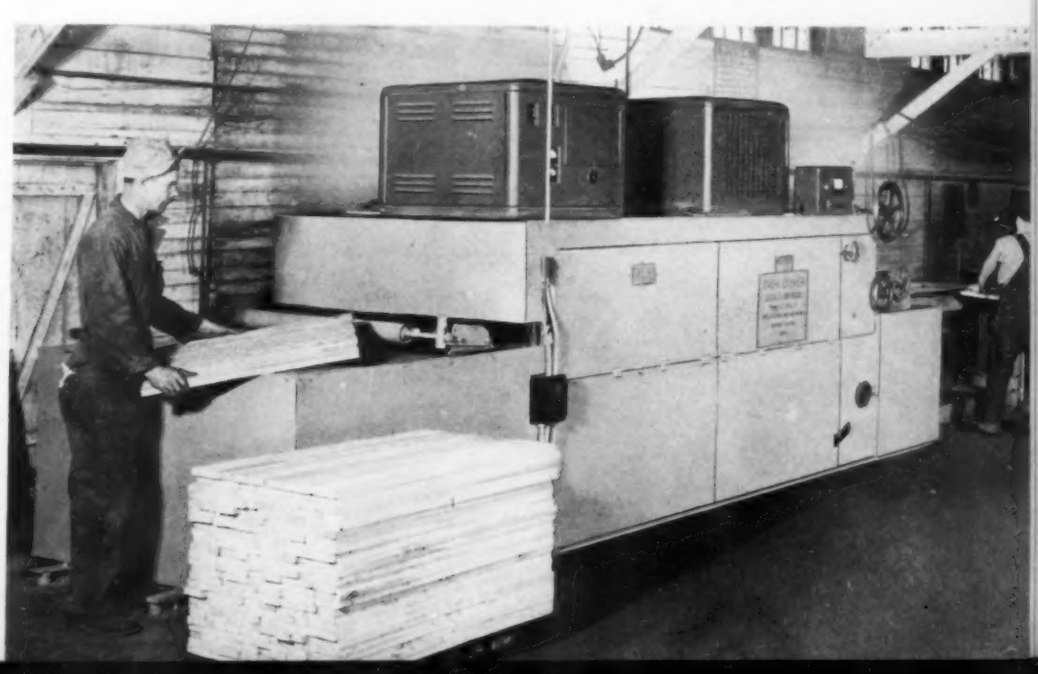
Performance of machine

All these problems have been solved mechanically in this machine. Pieces to be glued are placed on the feeding table and the adjustable feed bars convey the strips longitudinally into the machine. As they enter on the clamp bed, the sectional compression rollers press the individual pieces downward to the bed. As the strips pass under the rollers, side pressure is automatically applied—the clamp jaws being approximately 5 in. on center. Each clamp jaw is capable of producing a maximum compressive force of 200 p.s.i. over the edge of the pieces to be glued. The amount of side pressure is adjustable. It is maintained during the curing cycle as the retaining clamps carry the strips to be glued, and to which the glue has previously been applied, through the high frequency field.

Over-all length of machine is 25 ft. including in- and outfeed tables. It has a maximum width of 37 in. and there is no limit to length, as with different feed table, material can be glued continuously. The clamp bed is powered by a Reeves variable speed drive and the machine has a range of feed to 6 to 30 lineal ft. per minute.

The speed at which materials can be glued varies with the type of wood, its dryness and the type of adhesive used. If panels are being edge glued from lumber that has previously been ripped to standard widths, it is not necessary to match for width. But if panels going in are made from random width, as is customary in the fabrication of hardwoods, the panels must go over a matcher saw before going into the machine. However, this is customary, in most edge gluing operations.

The company admits that this machine is not a cure-all for gluing problems. It will not perform on improperly manufactured material any better than any other clamping device. Variations up to $1/4$ in. are within the limits of the machine, but variations beyond this will create too great a variation in pressure. Material can be surfaced directly from the machine but final surfacing is not recommended at this point.



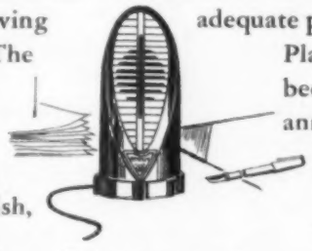
2—Outfeed end of machine can be seen here with glued panels coming from unit

Plaskon Molded Color helps make the new Versatex more versatile!

This Model 718-A Versatex is an extremely versatile high-output diaphragm crystal microphone. It is suitable for placement on table top, desk top, or any other flat surface; it fits conveniently into the palm of the hand when used as a hand microphone; and it may be used on a conventional floor stand for home recording, public address systems, and similar purposes.

IN THE HAND

The Plaskon Molded Color case of the Versatex serves many purposes. The case is strong and shock-resistant, giving adequate protection to the delicate pick-up mechanism it encloses. The Plaskon material helps provide electrical insulation because it is a non-conductor of electricity. It also prevents annoying noise pick-up.



ON THE DESK

Plaskon Molded Color is warm and friendly to the touch. The gleaming, non-porous surface will not tarnish, check or corrode. These Plaskon features are important in the Versatex, because the unit is being handled constantly.

Plaskon molding materials have many distinctive advantages that give them widespread application in the electrical, household appliance, cosmetic, drug, garment and many other fields. We shall be glad to help you adapt versatile Plaskon materials to your manufacturing and merchandising needs. Write for free illustrated book showing many applications of Plaskon* products.

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ON FLOOR STAND

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In Canada: Canadian Industries, Ltd., Montreal, P.Q.

The Versatex is a product of Shure Brothers, Chicago, Ill., and is molded by Chicago Die Mold Corporation, Chicago, Ill.

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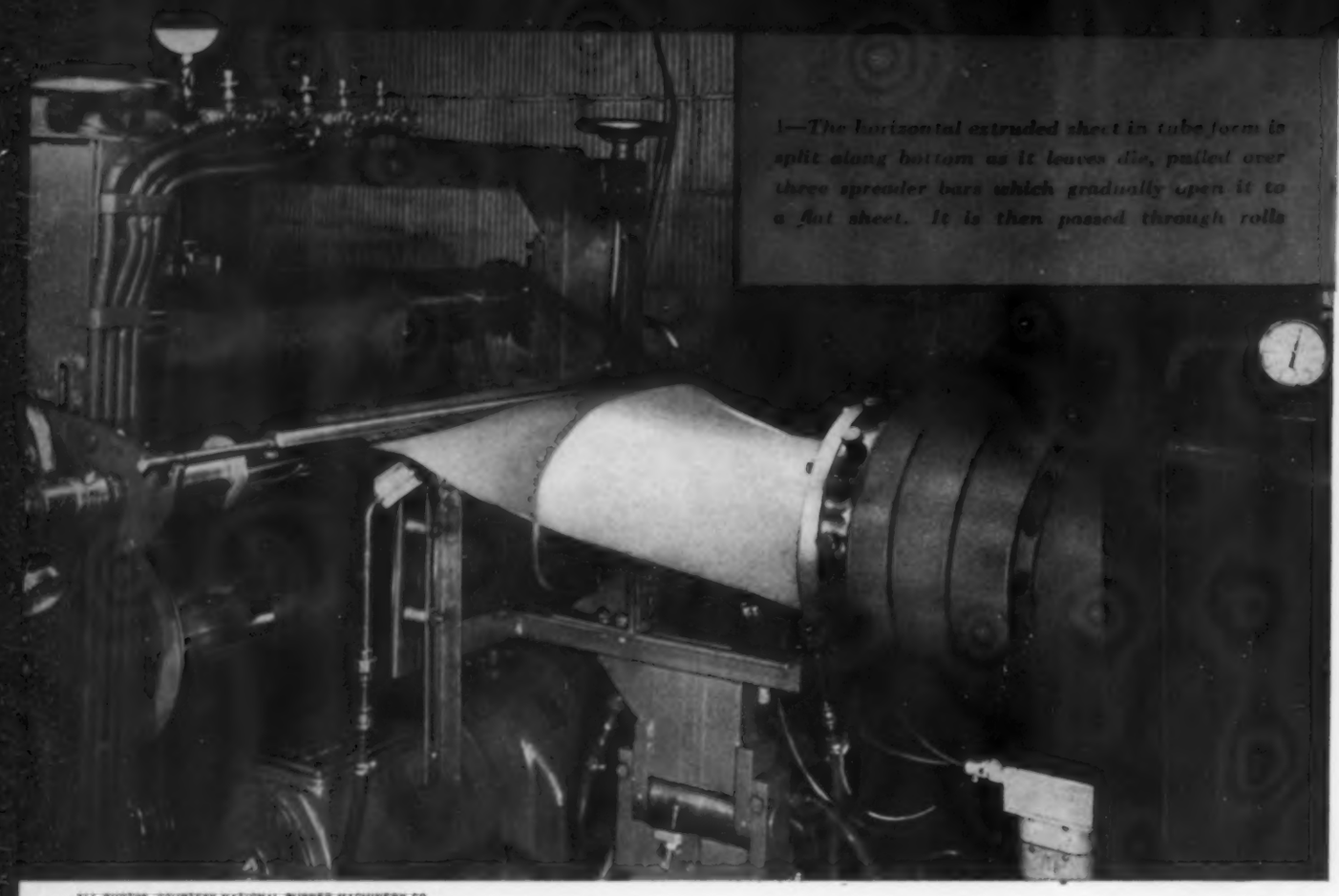


1—The horizontal extruded sheet in tube form is split along bottom as it leaves die, pulled over three spreader bars which gradually open it to a flat sheet. It is then passed through rolls

ALL PHOTOS, COURTESY NATIONAL RUBBER MACHINERY CO.

New complete sheeting unit

THIN-GAGE thermoplastic sheeting can now be turned out in volume on a single unit, offered to the industry by National Rubber Machinery Co., Akron, Ohio. On the basis of the quality of this sheeting, the volume production and the savings in cost, it is anticipated that the machine will prove particularly valuable to big-volume producers of packages who are potentially tremendous users of plastics.

The equipment mentioned above consists of a standard 3½-in. oil heated extruder, a special sheeting die and a pull-off and cooling unit which automatically trims the thermoplastic sheet, cuts it to length, or winds it up on reels.

The unit is basically the same as the one originally developed by Tennessee Eastman Corp.,[1] somewhat modified by the machinery company engineers to adapt it for commercial operations. In test runs the machine has produced clear cellulose acetate sheeting, 24 in. wide but trimmed to a 22-in. width, at a rate of more than 150 lb. per hour. Thicknesses of 8 to 40 thousandths are obtainable. Experimental department tests indicate that other thermoplastics may, in time, be successfully extruded in sheet form on the equipment.

While test production has thus far been confined to 24-in. wide sheeting, the pull-off equipment can handle stock up to 36 inches. A die head for this width sheeting, which is interchangeable with the smaller head can be made available.

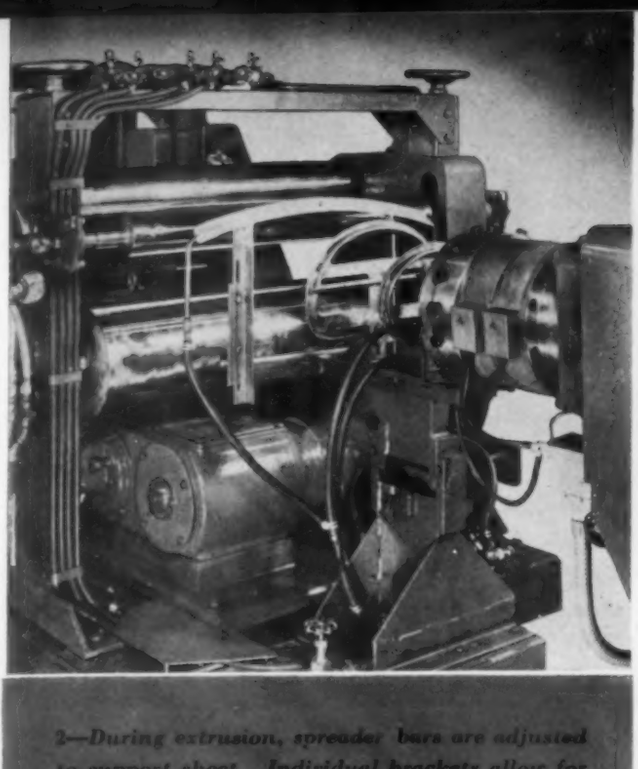
The circular sheeting die

The especially developed 9½-in. diameter circular sheeting die is, with few exceptions, an exact duplicate of that developed by the Tennessee Eastman Corp. for the original sheeting unit. The design (Fig. 3) is very much like that of a tubing die.

It is, of course, of utmost importance that the interior of this die, especially the spider supporting the mandrel, be very carefully streamlined and highly polished. For these reasons, and to maintain dimensional stability, the whole die is made of Carpenter Stentor tool steel. Both the inner and outer die rings of the mandrel are interchangeable. The outer ring is also concentrically adjustable with adjusting screws closely spaced around the circumference. By replacing the outer ring, the gage of the plastic sheet may be varied.

The heavy section of the mandrel is heated with 1450-watt cartridge heaters, while the outer section of the die is heated with two 3000-watt band heaters. Both the band and cartridge heaters are controlled by two Wheelco proportioning-type capacitrols.

[1] Cellulose ester plastic sheeting produced by non-solvent continuous extrusion," MODERN PLASTICS *23*, 132 May 1946.



2—During extrusion, spreader bars are adjusted to support sheet. Individual brackets allow for ample adjustment, but all bars are mounted so as to be swung down as unit when die opens

For quick opening the whole die is hinged and bolted to the cylinder heat extension with swing bolts.

The spreader bars

Immediately as it leaves the die, the horizontally extruded sheet in the shape of a tube is slit open on the bottom. This is accomplished with an interchangeable knife-like insert, blocking off a more or less small portion of the die opening. The split tube is then pulled over three spreader bars which gradually open it up to a plane sheet (Fig. 1).

This group of spreader bars, located comparatively close to the die, must be moved out of the way when the die is opened. They are, therefore, mounted on one common support, which is hinged to a base, permitting them to be swung down. Because these bars must be maneuvered during the extrusion to give proper support to the plastic sheet, they are mounted on individual brackets for ample horizontal and vertical adjustment.

The sheet of plastic material is air cooled as it leaves the die and passes over the spreader bars. When cellulose acetate butyrate is extruded, two circular jets blow warmed air against the inside and outside of the sheets. The inner jet, along the inner die ring, is generally used alone when cellulose acetate is the material.

Another tube, formed along edge of first two spreader bars and drilled with countless holes, sprays the heated air against the plastic before it can touch the bars themselves. The air chills the surface of the still soft sheet, thus protecting it from scratches, and also serves as a lubricator carrying the sheet over the bars.

The hot air inlets for the inner and outer die jets as well as for the spreader bars have individual adjusting valves and pressure gages conveniently located for the operator. Sixteen cu. ft. per min. of hot air, from 70 to 400° F., are provided by an 18-kw. Watlow air heater, controlled by an indicating thermostat and contactor which may be installed on an 80 p.s.i. compressed air line. This well-insulated installation is mounted on the main base of the take-off unit.

The pull-off unit

From the spreader bars, the last one of which is located directly next to the first roll of the pull-off unit, the plastic sheet is pulled through the pull-off unit, trimmed in width and automatically cut to length or wound on a reel, whichever is desired. The pull-off unit, which provides take-off speeds from 4 to 24 ft. per min., accommodates sheet up to 36 in. wide. It consists of two units, front and rear. Each side of 4-in. diameter roll of the front roller unit which first comes in contact with the plastic sheeting is vertically adjustable. Thus the roller may center the plastic sheet on the rolls and adjust it on the last spreader bar. Passing over the first 4-in. diameter roll, the extruded plastic sheet is pulled firmly and positively over two 8-in. diameter rolls. The now completely flattened sheet is guided by another 4-in. diameter roll to the rear roller unit approximately 4 ft. from the front unit. In this distance, the still warm and pliable plastic sheet is slightly stretched and then cooled. Stretching is accomplished by running the rolls of the rear unit at somewhat higher speeds than the rolls of the front unit.

The fairly cool plastic sheet coming from the front roller unit is further cooled by the water-cooled rolls of the rear roller unit.

At the rear roller unit, the plastic sheet is again pulled tightly over two 8-in. diameter rolls approximately 16 in. apart. Two 4-in. diameter rubber snubbing rolls pressing with adjustable spring tension against each one of the 8-in. steel rolls prevent the plastic sheet from slipping. This is especially important because the driven slitter knives trimming the sheet to uniform width are located between the two 8-in. diameter rolls of this rear unit. By the time sheet reaches knives, it must have been cooled so it is entirely set and hard.

The position of the slitter knives may be adjusted to any width up to 36 inches. The snubbing rolls also are equipped with a mechanism to quickly retract them in case the plastic sheet should lump up as it may do at the start of the extrusion. For the same reason, the plastic sheet is at first passed over or under—instead of through—the slitter knives until the sheet has become smooth and even.

The rolls of both the front and rear roller units are built hollow—in the case of the front rolls so they can be heated to keep the sheet soft and pliable and in the case of the rear unit so they can be cooled to stiffen plastic sheet.

The front rolls are provided with rotary unions for the circulation of either steam or oil. Inasmuch as only moderate steam pressures (10 to 25 p.s.i.) are required, these rolls are usually steam heated. However, if they

are to be oil heated, an additional 8-kw. oil heating unit of the same type as the 18-kw. unit (see next page) is required. The rear rolls are also provided with rotary unions and with temperature indicating gages for water circulation.

All roll surfaces in contact with the plastic sheet are surface hardened, polished to a mirror finish and then hard chrome-plated. The front and rear roller units are separately driven with a 2-hp. Reeves variable speed drive, normally operating on 220/440 volts, 3-phase, 60-cycle, AC current.

The cutter

The frame of the rear roller unit supports the guillotine-type cutter and its air-operated toggle mechanism, with which the continuously extruded sheet is automatically cut to a given length. The solenoid-operated air valve controlling the cutter operation is actuated by a cam-operated switch. The cam is driven through a Graham variable speed transmission, synchronized with the takeoff speed. Varying the transmission ratio with the manually operated control handle will vary the sheet length from a minimum of 2 ft. to any desired length.

Instead of being cut to a given length, the continuously extruded sheet may be wound on a takeup reel also incorporated in this unit. The aluminum reel flanges slide over a square shaft and are adjustable to any desired width up to 36 inches. If not specified otherwise, the flanges will be provided to accommodate a cardboard core (tube) $8^3/_4$ (inside dimension) by $9^1/_2$ in. (outside dimension), onto which the plastic sheet is to be wound.

In order to bring the core into place, or to remove the full roll of plastic sheet, the flanges slide off the reel shaft. The reel is independently driven by a "torque" motor, whose torque varies in inverse proportion to the motor speed by adjusting manually an auto-transformer in this unit, thus varying its input voltage and subsequently the torque. The reel takes the sheet at constant tension at about the same rate the pull-out rolls deliver it. The center of each reel is located conveniently low so it may be rolled in and out of place without difficulty. Two sets of reels are provided to facilitate quick exchange while the unit is in operation.

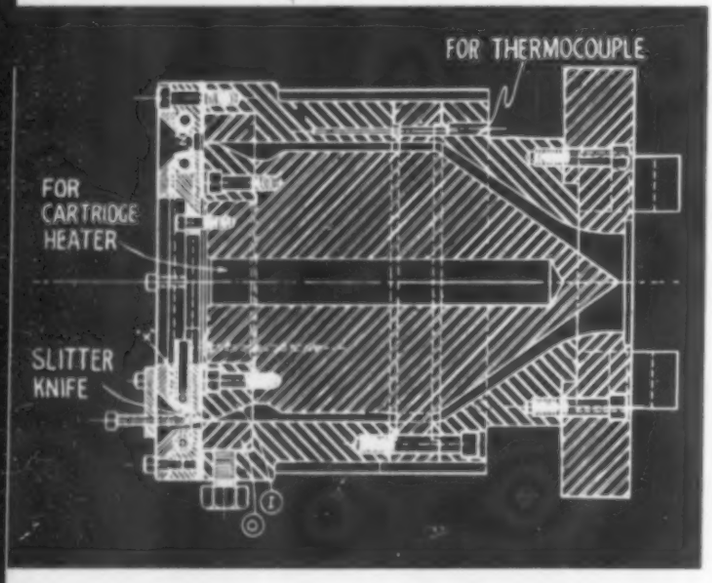
The extruder

The base cylinder of the standard $3^1/_2$-in. oil-heated National Rubber Machinery extruder used in this sheeting operation consists of a one-piece casting, having three separately jacketed chambers: two for oil heating and one for water cooling at the hopper section. The bore is $3^1/_2$ in. in diameter and is fitted with a hard, corrosion-resistant liner of IRL Alloy 306. The hopper is of the center feed type, with chrome plated interior.

The head cylinder, of a fabricated and cast-type construction, has a jacket with one chamber for oil heating. The bore of this section is $3^1/_2$ in. in diameter, fitted with a hard, corrosion-resistant IRL Alloy 306 liner. The front end of the head cylinder is provided with a full diameter strainer plate and screens.

The drive transmission which consists of an enclosed

3



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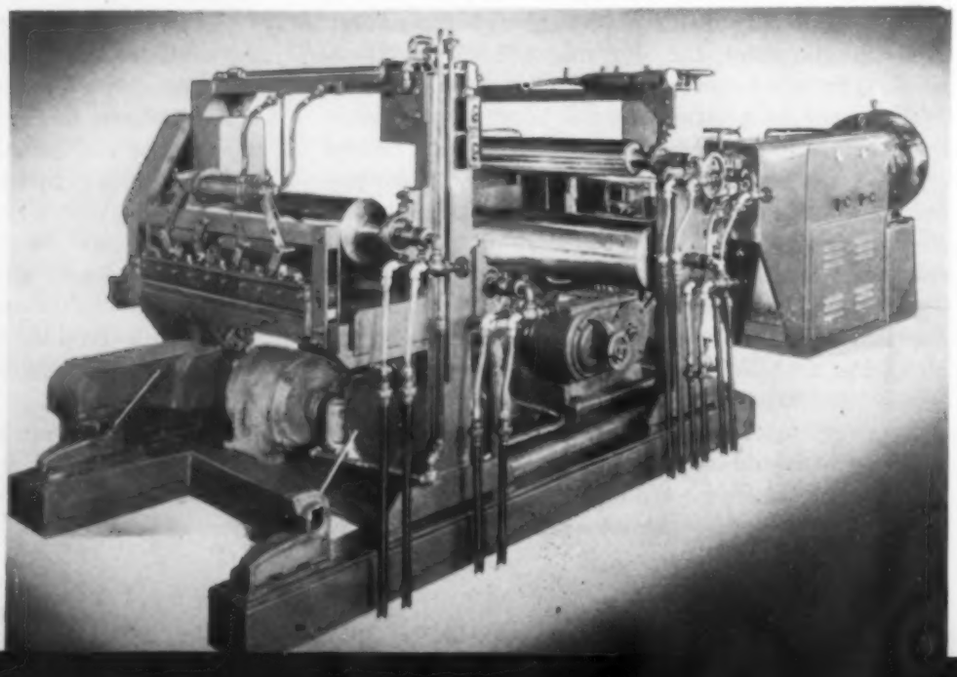
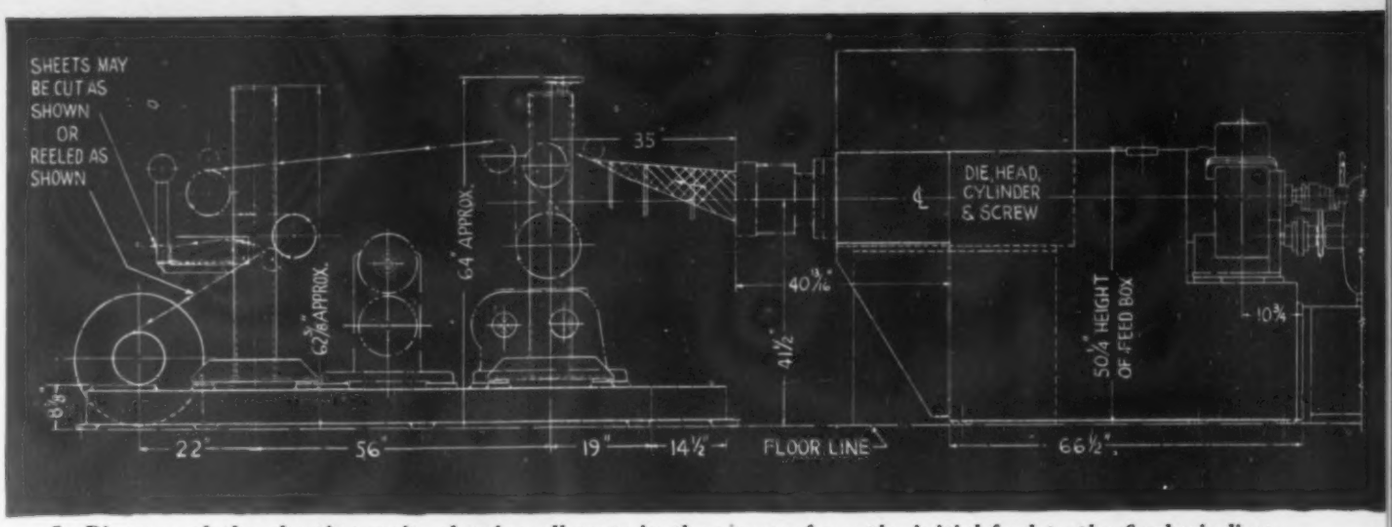


3 (above)—Diagram of circular sheeting die which measures $9^1/_2$ in. in diameter. 4 (right)—The unit, looking from winders, past rollers, spreaders and die head to feed box



5—Diagram of the sheeting unit, showing all parts in the process from the initial feed to the final winding

housing with self-lubricated, heavy-duty Falk herringbone gears of a ratio of 36.6 to 1, has automatically lubricated over-size thrust and radial roller bearings, and is mounted on a sturdy fabricated steel base.

The drive motor, which is a 20-hp. Reliance DC motor, frame No. 66T, with speed ratios from 218 to 1750 r.p.m. obtained by voltage control and from 1750 to 2200 r.p.m. obtained by field control, is direct-coupled with a heavy duty Falk coupling. Also included in the electric drive is a type A-10 Reliance AC/DC VS control, consisting of an AC motor and a DC generator with variable output voltages, for operation on 220/440 volts, 3-phase, 60-cycle AC current. It will provide screw speeds of 6 to 60 r.p.m. The DC drive motor is mounted on a sturdy cast base, bolted to the main extruder base.

The feed screw which is $3\frac{1}{2}$ in. in diameter, is full flighted, of heat-treated alloy steel, chrome plated, and has surface-hardened flight lands. It is also hollow bored and fitted with a rotary union for fluid heating or for cooling.

The oil heating and cooling unit is of 18-kw. capacity; it is arranged for steady operation at temperatures up to 575° F., and is furnished complete with circulating pump and motor, immersion heaters, indicating and control thermostat and panel-mounted electrical controls. Cooled oil can be quickly circulated to the extruder by means of a selector switch on the control panel. Temperature control valves regulating the oil flow and thermometers indicating the temperature of each zone are included. As a heat transfer medium, Socony Vacuum heat transfer oil is exclusively recommended for this work.

Extrusion by this unit is an art, as are all other plastic extrusions. But once acquired, that art and this machine will produce good sheet.

A NEW TYPE WIRELESS WALKIE RE-ceiver with a phenolic case permitting a person to hear translations of speeches in as many as six different languages simultaneously with the speaker's delivery has recently been introduced by the International Business Machine Corp., 590 Madison Ave., New York City. Its wearer is able to move about freely while hearing the translation—as long as he remains within the loop of an antenna which encircles the auditorium. The broadcast cannot be received outside the building. This receiver is ideal for use by the UN.

The case, which resembles a small camera and weighs only $1\frac{1}{2}$ lb., is molded of Resinox 3941 by the Oris Mfg. Co., Inc., Thomaston, Conn. The earphones are also molded of this material. Unit has on-and-off switch, selector dial and volume control knob.

She ruined her date on the ironing board

ONE OF THESE WOULD HAVE SAVED IT

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Remember this . . . *no one plastic serves all plastic needs* . . . no more than any one metal meets all metal requirements. So, when buying, selling or making plastic products or parts request information that will assure you they are soundly designed in the plastic best suited for the jobs they must do.

BE SURE YOU GET THE DIFFERENCE

Two plastic buttons may look exactly alike. The difference is that one is made of the right plastic properly designed and applied. To make sure of long service, look for informative labelling or ask for the facts about the plastic products you buy.

QUESTIONS PLEASE! Our technical staff will be glad to help you solve problems in plastic application and design. And if our materials do not fill the bill exactly, we will cheerfully direct you to the right sources. American Cyanamid Company, Plastics Division, 32 Rockefeller Plaza, New York 20, N. Y.

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When Is a Good Plastic NOT a Good Plastic?

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goes beyond the promotion of our own materials.
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by pointing out
to manufacturers and retailers that
no one plastic serves all plastic needs . . .
and that, therefore,
users and buyers of plastics
must be aware that there are
differences in basic materials
and they must learn to recognize
which is most suitable
for a specific application.

For, as we all know,
a good plastic
is NOT a good plastic
when wrongly applied.

AMERICAN CYANAMID COMPANY, Plastics Division,
32 Rockefeller Plaza, New York 20, N. Y.

*this series will reach manufacturers, retailers and consumers through monthly insertions in such publications as Time, Fortune, Department Store Economist and Chain Store Age, beginning October.

This new way of molding a product in two colors and in one piece is neither expensive nor complicated. It involves a double molding and a single setting operation. Only requirement is that decorations be raised

Two-color thermosetting moldings

SECOND-COLOR decorations and lettering may be molded into such thermosetting plastic articles as buttons, bottle tops, plaques and cosmetic boxes at the time the bodies of the parts are formed. The only limitation on the decoration is that it be raised. A method of producing such one-piece, two-color moldings is to be found in a patent issued to Forrest G. Purinton and William A. Zwiekel in 1944 and assigned to the Patent Button Co. of Waterbury, Conn., but little used up to the present time.

Compared with the usual method of adding a second color to a thermoset molded piece by filling a depressed design with paint, lacquer or colored waxes, this method permits a saving in mold costs, since a mold for producing depressed areas in the molded piece is generally more expensive than one for producing raised lettering or decoration. There is a saving also in labor costs, since the filling and wiping operations are not needed. The resultant product is furthermore declared to be clearer, to look better and to wear longer than one on which color has been wiped or filled in.

Double molding, single setting

Development work centered around the molding of an opaque phenolic button with a raised design of translucent urea material on its face. A double molding and a single setting operation are used, and the whole process is neither expensive nor complicated. A standard back cavity and face cavity are used, the latter being mounted on the lower or movable portion of the press. The only additional piece of equipment is a hardened flat steel plate. In operation, a thin urea preform is placed in position on top of the face cavity which is designed with depressed decorations or lettering. The flat intermediate plate is then placed on top of the preform and the mold closed under comparatively low pressure. As the upper side of this plate reaches the bottom of the back cavity, pressure is exerted on the urea material which forces it into the design depressions.

This set-up is a flash type mold, so far as the closure between the flat plate and the lower face cavity is concerned, and permits the excess material to flash out. The time required is a matter of 2 or 3 sec., depending upon the speed with which the press closes. As soon as this phase of the cycle is completed, the press is opened slightly, the plate withdrawn and a second pill, preferably of opaque phenolic, is placed on the top of the face cavity.

From this point on, the molding operation is the same as that used for standard button production. A satisfactory bond is obtained between the two dissimilar thermosetting materials, and the slight film of urea, which remains on the surface of the phenolic, in no way detracts from the appearance of the button. Being translucent and very thin, it cannot be detected by the naked eye.

Multiple-cavity mold, too

Although the experimental work was conducted with a single-cavity mold, it is perfectly feasible to make use of this method with a multiple-cavity mold. If the faces of all the cavities are ground so that their heights are uniform and if their backing plates are true, contact between all backs and faces will be uniform. This uniformity of dimension permits the flat plate to be inserted between the faces of the multiple-cavity mold and will cause a uniform distribution of pressure over all of the mold parts.

It may be necessary to make a slight well or depression in each cavity in order that the translucent urea material may be uniformly trapped and not flow out over the surface of the piece. This feature can easily be incorporated in the original mold design, and should guarantee that no urea material is visible on the molding except in the decoration.

If the lower or face die has a slightly concave surface, then the intermediate plate should have a bottom surface conforming to that shape, in order that all excess urea may be flashed out.

Photo courtesy of Peerless Plastics, Montebello, California

. . . get high speed production of low-pressure laminates with PARAPLEX P-13

When you want durability coupled with a high degree of permanent flexibility, turn to PARAPLEX P-13. No elaborate equipment is needed, for this resin, like the other members of the PARAPLEX "P" series, cures at moderate temperatures, under contact pressure, to form clear, tough thermoset compositions with both eye-appeal and practicality. Wall coverings made with PARAPLEX P-13 add new beauty to kitchens, bathrooms, and nurseries . . . provide washable mar-proof surfaces.

Other PARAPLEX "P" series resins include: PARAPLEX P-10, a transparent, highly flexible, tough resin with excellent resistance to water and chemicals; PARAPLEX P-33, a semi-rigid resin, outstanding in toughness and tear resistance; PARAPLEX P-43, a fast curing resin for castings and laminates of excellent rigidity, durability and electrical properties.

Our booklet, *"PARAPLEX for Laminating and Casting Applications"* gives full information on these new resins. Send for your copy today.

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Photo, courtesy of American Cyanamid Co., illustrates nozzle of Randolph "4" Fire Extinguisher as molded of Melmac 3020 by Plastic Molders Inc. of Chicago.

impact strength • chemical resistance •

Whenever a plastic formulation "has to get tough" — the use of any one of four carefully graded Claremont Fillers will supply the needed structural strength! For the molded nozzle of this fire-fighter, Melmac 3020 (compounded with a Claremont Fabric Filler) delivered the required toughness . . . in no way disturbing the necessary properties of chemical resistance . . . and in no way affecting the brilliance of the part's red color.

For their "strong behavior," Claremont Fillers are used in the field's best known plastic formulations! Available in four types (flock, thread, chopped fabric and cord), these plastic muscle builders are carefully graded, uniform in size and processed to specific requirements. Samples for laboratory test runs available upon request. Inquiries invited!

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STYRENE is produced by catalytic cracking of ethylbenzene formed by direct alkylation of benzene by ethylene. All processes are continuous.

Alkylation of benzene

Ethylbenzene is produced continuously (Fig. 1) by the ethylation of benzene in the presence of aluminum chloride at atmospheric pressure. The reaction is carried out in a tower, into the top of which is fed aluminum chloride free from water. The aluminum chloride is mixed with benzene and added intermittently by screw feed. The rate of addition is 10 to 20 kg. per hour. The benzene mixed with the aluminum chloride is added at the rate of 200 l. per hour. The main benzene supply at the rate of 800 l. per hr. is added at the bottom of the tower. The ethylene from a gas holder is passed through a preheater and is heated to 96 to 98° C. It enters the bottom of the tower which is heated by steam. The rate of ethylene addition is 100 kg. per hr. and the proportion of ethylene to benzene is so controlled that 40 percent of the benzene is not ethylated.

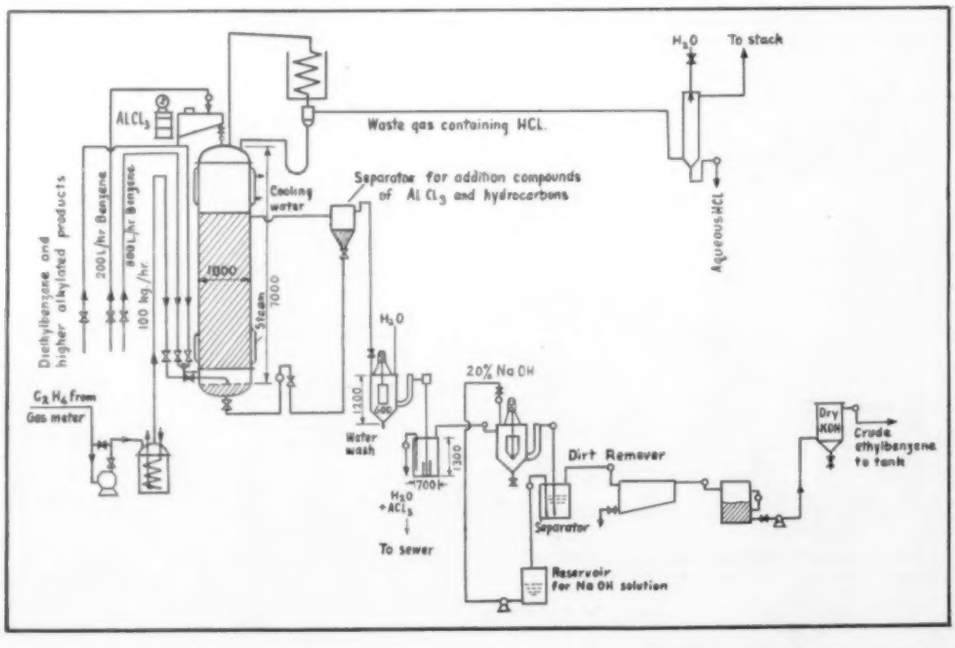
Aluminum chloride forms a liquid addition compound with hydrocarbons, and the catalyst consists of this addition compound, partly in solution and partly suspended. The top portion of the tower is water cooled, and the reaction products at 100 to 102° C. are removed from the top. These consist of 35 to 40 percent ethylbenzene, 15 to 20 percent diethylbenzene, and 2 to 3 percent higher alkylated ethylbenzenes and condensation products. There is an auxiliary condenser which separates hydrochloric acid gas from any vaporized products which are condensed and returned to the tower.

The reaction products are passed to the separator where the catalyst separates by gravity and is returned to the bottom of the reaction tower. The products pass to a stirring vessel where they are washed by water, then to a container where the water separates. The products are next washed in a stirring vessel with a 20 percent solution of sodium hydroxide. In next vessel this solution is separated and recirculated. Products are dried by passing through solid potassium hydroxide.

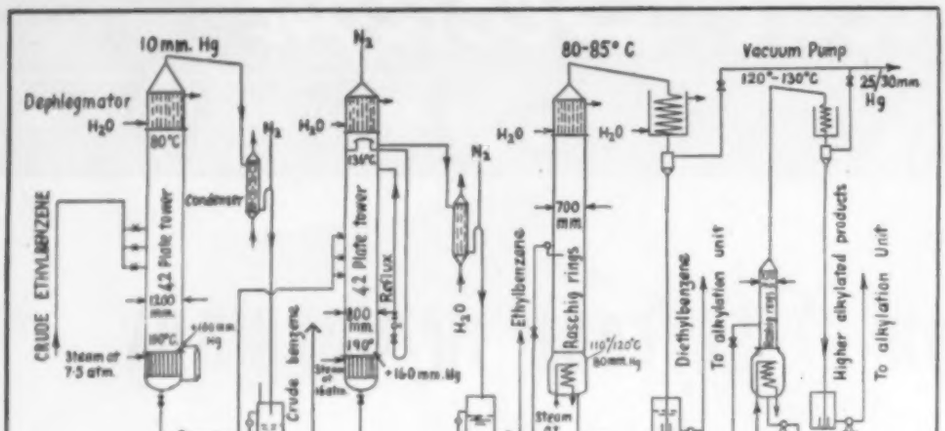
Distillation of crude ethylbenzene

The crude ethylbenzene is continuously distilled (Fig. 2) by passing it first into the center of a 42-bubble plate

* "Investigation of German plastics plants," by G. M. Kline, J. H. Rooney, J. W. C. Crawford, T. Love and F. J. Curtis. PB 949.



1—The set-up for the alkylation of benzene to ethylbenzene is shown in this sketch



2—Crude ethylbenzene is continuously distilled as shown in this diagram. It is passed first into center of a 42-bubble plate tower

tower in which the benzene is separated at the top. This distillation is conducted at 10 mm. Hg pressure, and the vacuum is broken by nitrogen. The ethylbenzene mixture passes from the bottom of the first column to the center of a second column which is similar to the first. Here the distillation is done in an atmosphere of nitrogen, and the ethylbenzene is distilled under 160 mm. Hg pressure. In the second column ethylbenzene is separated from the higher alkylated products. The higher alkylated products are fed from the bottom of the second column to the center of a third column packed with Raschig rings. Here under reduced pressure the higher alkylated products are separated from the residue which is further distilled in a small column packed with Raschig rings where the final residue is discarded and the distillate mixed with the higher alkylated products from the third column. These higher alkylated products are fed with the benzene into the original reactor and reduce formation of further higher alkylated products.

The yield of pure ethylbenzene is 90 to 94 percent, calculated either on ethylene or benzene. Peak capacity was 500 tons per month; the present capacity is 450 tons per month.

Dehydrogenation of ethylbenzene[1]

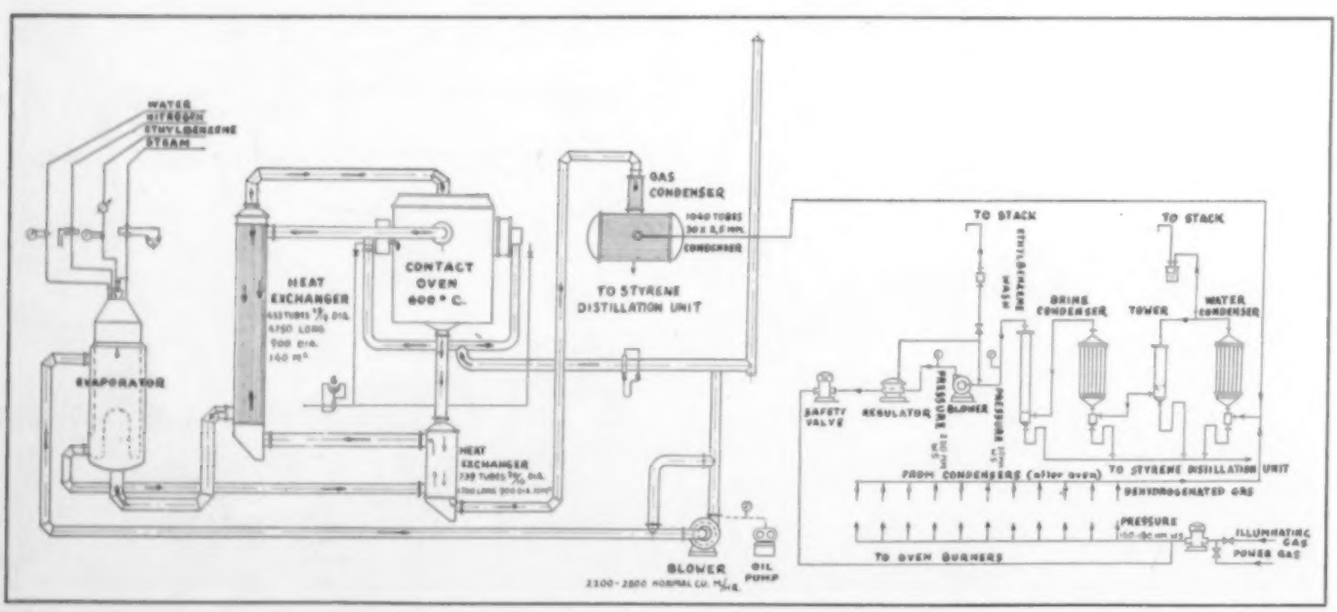
The dehydrogenation of ethylbenzene (Fig. 3) is done continously at 600° C. in the presence of water and dehydrogenation catalyst. The catalyst is used in the form of pellets, 4 to 6 mm. in diameter and 10 to 12 mm. long. Catalyst originally used had this composition:

ZnO	50
Al_2O_3	40
CaO	10

This catalyst had a life of one year and gave yields from

[1] Further details regarding this process will be found in the following two reports: "Manufacture of thermoplastics in plants of I. G. Farbenindustrie A. G., Germany" by R. H. Boundy and R. L. Hasche. PB 1069; "Miscellaneous chemicals, I. G. Farbenindustrie A. G., Ludwigshafen and Oppau," by J. G. Kern, R. L. Murray and R. W. Sudhoff. PB 485.

3—Set-up for dehydrogenation of ethylbenzene to styrene, done continuously at 600° C. in presence of water, catalyst



85 to 75 percent styrene (calculated on ethylbenzene) depending on the age of the catalyst. Experience showed that it was better to reduce the amount of aluminum oxide and increase that of zinc oxide.

Potassium hydroxide in conjunction with potassium sulfate was found useful for initiating the reaction. The following catalyst was used:

ZnO	90
Al_2O_3	10

To this was added 3 percent potassium sulfate and 3 percent potassium hydroxide (calculated on zinc oxide plus aluminum oxide as 100). The activity of this catalyst was good but short-lived. It was not used in production.

It was also found that potassium chromate improved the activity and life of the catalyst. The catalyst mixture used, Lu. 82, was as follows:

ZnO	85–86
Al_2O_3	3–4
CaO	5
K_2CrO_4	3
K_2SO_4	2

This catalyst gives yields of 93 to 88 percent styrene and a life of one and one-half years. It also has the advantage of operating at a lower temperature: 580° C. when fresh, 620° C. after one and one-half years. At lower temperatures less residual gas is produced.

Hydrogen is formed by the reaction:

$$C_6H_5C_2H_5 \rightarrow C_6H_5CH=CH_2 + H_2$$

At higher temperatures some ethylbenzene is carbonized and the deposited carbon reacts with the water vapor:

$$C + H_2O \rightarrow CO_2 + H_2$$

The cracking of ethylbenzene to benzene and ethylene also occurs. Hence the residual gas may contain ethylene or ethane.

Some methane is formed by production of stilbene:

$$2C_6H_5C_2H_5 \rightarrow C_6H_5CH=CHC_6H_5 + 2CH_4$$

With the original catalyst, 70 to 80 cu. m. of residual gas was produced per 100 kg. styrene. Lu. 82 gives 40 cu. m. residual gas per 100 kg. styrene. The percentage composition of the residual gases is:

CO_2	8–10
C_2H_6	0.4–0.8
O_2	0.5
CO	0.2–0.8
H_2	85–88
CH_4	1–3

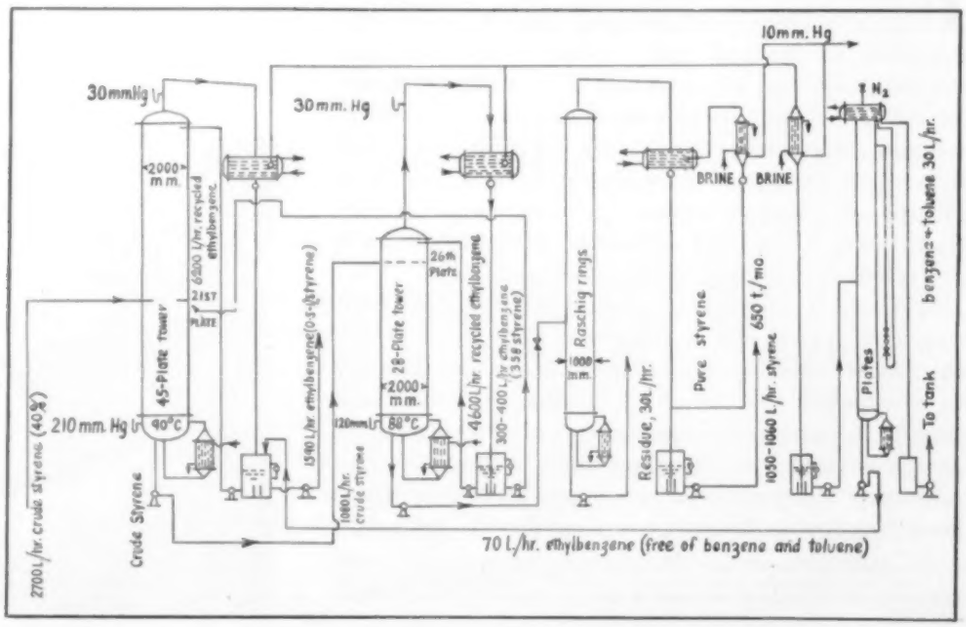
Further catalyst research showed that the addition of magnesium oxide further reduces the temperature of reaction. The catalyst now preferred is Lu. 144G.

The percentage composition is:

ZnO	82	To this is added 3% K_2CrO_4 and 3% K_2SO_4
Al_2O_3	8	
CaO	5	
MgO	5	

This catalyst operates when fresh at 560 to 570° C. to give a 93 percent yield. After one and one-half years the temperature is 600 to 610° C., the yield 88 percent. The useful life is two years. Lu. 144G in pellet form does not tend to disintegrate as does Lu. 82. The materials used in preparing the catalyst are pure. The zinc oxide is prepared from zinc sulfate by precipitation with ammonia. Aluminum oxide is prepared from aluminum sulfate. The calcium oxide and magnesium oxide were obtained from Merck. These were mixed with water to a paste. The potassium chromate and potassium sulfate were mixed with this or sprayed on the solid pellets. The pellets were formed from the paste by extrusion.

In the production of styrene, ethylbenzene and water (in the proportion of one part ethylbenzene to 1.2 parts water) are passed through an evaporator and heat exchanger, both of which are heated by the exhaust gases from the reaction chamber. This reaction chamber is divided into two sections, each containing 13 catalyst tubes. These tubes, 22 cm. inside diameter and 3 mm. long, are lined with nicrotherm, a copper manganese alloy containing 3 percent man- (*Please turn to page 242*)



4—Separation of styrene from the condensate is illustrated here

Ethyl cellulose compositions—

Factors affecting outdoor durability

by BEDFORD BERRY and WILLIAM KOCH*

Properly formulated, clear ethyl cellulose compositions possess remarkably good outdoor durability. This is accomplished by using water-insensitive plasticizers which are good ultraviolet screening agents, such as tricresyl phosphate, triphenyl phosphate and diphenyl phthalate. The stability of the composition is further augmented by the use of a small percentage, usually about 1 percent, of a phenolic-type antioxidant characterized by being exceptionally free of objectionable color-developing tendencies, such as menthylphenol, diisobutylphenol and *p*-cyclohexylphenol. Clear film and plastic formulae with good weatherability are given to illustrate proper formulation principles. These are of importance in formulating all types of plastics, film and protective coatings which may be subjected to outdoor exposure. The data also show that, unless properly formulated, ethyl cellulose degrades rapidly and becomes brittle within a short exposure period.

THE DEVELOPMENT of ethyl cellulose compositions that are capable of withstanding the effects of outdoor weathering was initiated soon after Benjamin M. Axilrod and Gordon Kline[1] published the results of their investigation of clear plastic sheets for use as airplane windshields and visors. The ethyl cellulose compositions investigated by them were found to become opaque and exceedingly brittle within three months upon outdoor exposure. They noted that only that portion of the film exposed to sunlight failed, the protected edges remaining clear and flexible.

It should be pointed out that, at the time their work was done, practically nothing was known concerning the proper formulation of ethyl cellulose for resistance to weathering, and the ethyl cellulose formulae used then were purely experimental and preliminary in nature. Nevertheless, the importance of their observations was fully appreciated, because of the bearing which good weathering resistance has on plastic, protective coating and film applications. However, it was felt that good weathering performance was largely a question of proper formulation. This view was well substantiated by investigation, and it is the purpose of this article to present substantiating data and to show how ethyl cellulose can be formulated to resist weathering.

Formulation and testing

Some preliminary testing was carried out to determine the best type of test specimens to use. This showed that clear sheets, approximately 0.010 in. thick, cast from solution and carefully dried and conditioned, were ideal for weathering tests. Ultraviolet light (Fade-Ometer) exposures were used as a rapid screening test to select materials for outdoor weather tests. Films, 0.003 in. thick, were cast from solution, dried and conditioned for this screening test.

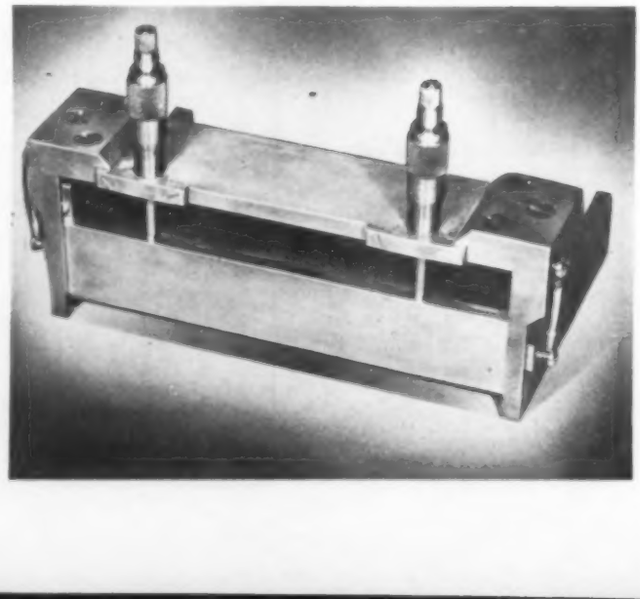
All 0.010-in. films were prepared from solutions containing 20 percent by weight of ethyl cellulose dissolved in the following solvent composition:

Denatured ethyl alcohol	15 parts
Toluene	60 parts
Xylene	20 parts
Butanol	5 parts

Modifiers were then added to the ethyl cellulose solutions as required. The 0.003-in. films were similarly prepared from 15 percent solutions.

Most of the development work was carried out with N-100, K-100 and G-100 ethyl cellulose types. These

1—*Films were cast on plate glass with this casting knife*



* Hercules Experiment Station, Hercules Powder Co., Wilmington 99, Del.

[1] "Study of transparent plastics for use on aircraft", by Benjamin M. Axilrod and Gordon M. Kline, Jour. of Research *19*, 367–400 (1937) (Research Paper RP 1031).

Table I.—Effect of Plasticizer on Ultraviolet (Fade-Ometer) Resistance of Ethyl Cellulose[a]

Plasticizer	*Embrittlement in Fade-Ometer[b]*
	hr.
Control (no plasticizer)	72
70:30 tricresyl phosphate: Pentaphen	>192
70:30 tricresyl phosphate: triphenyl phosphate	192
70:30 tricresyl phosphate: diphenyl phthalate	168
Pentaphen (*p-tert*-amylphenol)	144
Dow 6 (di-*o*-xenyl monophenyl phosphate)	144
Diphenyl phthalate	96
Phenyl diglycol carbonate	96
Methyl Cellosolve stearate S-943	96
Zerice 45 (mineral oil)[c]	72[e]
Nevinol (coumarone-indene)	72[e]
Diamylnaphthalene	72[d]
Flexol 3GO (triethylene glycol di-2-ethyl hexoate)	72[d]
Diisobutyl carbinyl phthalate	72
Dow resin 276-V9 (styrene-like compound of relatively low molecular weight)	72
KP-23 (Butyl Cellosolve stearate)	72
Butoxyethyl diglycol carbonate	72
Phenyl xenyl ether	72
X-55 (diethylene glycol esters of fatty acids)	72
β-*p-tert*-Butylphenoxyethanol	72
Trioctyl phosphate	72
Santicizer B-16 (butyl phthalate butyl glycolate)	72
Paraplex RG-2 (sebacic acid-type alkyd)	48
Baker's No. 16 (bodied castor oil)	48
Fractol A (mineral oil)	48[e]
HB-40 (hydrogenated terphenyl)	48
Bakelite XRS-26 (polystyrene of relatively low molecular weight)	48[d]
Piccolastic A-5 (coumarone-styrene polymer)	48[d]
Flexol 460 (triethylene glycol di-2-ethyl butyrate)	48
Butylethyl diglycol carbonate	48
Cellosolve ricinoleate S-816	48
Butyl Cellosolve oleate S-817	48
Dow Resin 276-V2 (similar to V9)	48
B-400	48
Dibutyl phthalate	48
Raw castor oil	24
Dutrex 25 (petroleum derivative)	24[f]
Aroplaz 930 (nonoxidizing alkyd)	24

[a] All formulations 80:20 ethyl cellulose N-100: plasticizer. Unless otherwise indicated, the films were not visibly discolored. [b] The films were examined every 24 hours. [c] Now designated as Topar 45. [d] Slight discoloration. [e] Moderate discoloration. [f] Bad discoloration.

Table II.—Nitrogen-Containing Substances Having Stabilizing Action on Ethyl Cellulose[a]

Stabilizer	*Retention of viscosity after exposure to ultraviolet light for 50 hr.*
	percent
Control (no stabilizer)	9
p,p'-Diaminodiphenylmethane	65
p-Biphenyl-β-naphthylamine	38
Diphenylguanidine	16
Bornylaniline	18
Polymerized trimethyl dihydroquinoline	62
Diphenylamine	23
Diethanolamine	10
Dicyclohexylamine	101
Triphenylguanidine	27
Hydroxyethylethylenediamine	31
o-Tolylbiguanide	18
Triethanolamine	80
Phenylmethylpyrazolone	90
Carbazole	13
S-di-β-Naphthyl-*p*-phenylenediamine	93
Phenyl-β-naphthylamine	109

[a] Amount of stabilizing agent added was 1 percent by weight of the N-100 ethyl cellulose.

Table III.—Phenolic Compounds Having Stabilizing Action on Ethyl Cellulose[a]

Stabilizer	*Retention of viscosity after exposure to ultraviolet light for 50 hr.*
	percent
Control (no stabilizer)	9
Syringic acid	95
Eugenol	73
Hydroquinone monobenzyl ether	105
Hydroquinone dibenzyl ether	88
Hydroquinone monomethyl ether	80
p-tert-Butylcatechol	58
p-Hexylcatechol	107
p-Benzylcatechol	100
Belro phenol lactone[b]	118
Gallic acid	90
Vanillyl alcohol	42
p-Phenylphenol	69
Santophen 7 (*o*- and *p*-benzylphenol)	88
Santovar A (alkylated polyhydroxyphenol)	76
Hematoxylin	27
6-Caprylpyrogallol	85
Vanillin	14
o-Cyclohexylphenol	46
Hydrogenated gardinol	16
Menthylphenol[b]	45
Menthylguaiacol	80
Super-Beckacite 1001	88
Durez 6799	85
p-Cyclohexylphenol[b]	72
Diisobutylphenol[b]	60

[a] Amount of stabilizing agent added was 1 percent by weight of the N-100 ethyl cellulose. [b] Exceptionally resistant to discoloration.

are standard high-viscosity types of ethyl cellulose which are fully described elsewhere.[2] However, sufficient additional testing was performed to demonstrate that the same principles of proper formulation apply for all ethoxyl types and all viscosity grades of ethyl cellulose commercially available. It should be pointed out, of course, that in any one specific series of tests all results were obtained on a single lot of ethyl cellulose.

All films were cast on level plate glass with a casting knife having an adjustable casting blade as illustrated in Fig. 1. The films were dried on the plates maintained in a level position in a closed cabinet at room temperature for a period of 16 to 24 hours. They were then stripped from the plates and conditioned. Conditioning of the 0.010-in. films consisted of allowing them to air-dry for two weeks while suspended with free circulation of air around the film. They were then force-dried at 70° C. for 24 hr. in a circulating air oven with free circulation of air around the individual films. The 0.003-in. films, after being stripped from the glass

[2] "Hercules ethyl cellulose, properties and uses," Hercules Powder Co., p. 5, Form 500-16 (March 1944).

2—Above illustration and one on following page show effect of outdoor weathering on six ethyl cellulose compositions

plates, were given an immediate 24-hr. force-dry at 70° C., followed by 48 hr. conditioning at 50 percent relative humidity and 77° F. All films were 8 in. wide by 18 in. long. Sections, 6 by 6 in., were cut from the 0.010-in. films and exposed in special wooden racks which were made of unpainted cypress wood. Openings in the rack were 5 by 5 in. allowing 0.5 in. of film on all sides for secure clamping. The racks were exposed at an angle of 45° from vertical, facing the south sky.

Sections of 0.003-in. films for Fade-Ometer exposures were fastened to sheets of bond paper with metal staples.

Flexibility was measured by a simple folding test in which the film was tightly folded over on itself and pinched together between the thumb and finger. A film not cracking in this test was noted as flexible.

Percent viscosity retention, employed as a more precise measure of degradation, was measured by dividing the viscosity of the exposed composition by the viscosity of the same composition before exposure and multiplying by 100. Viscosities at 25° C. ± 0.1° C. were measured on 5 percent solutions of the ethyl cellulose compositions dissolved in 80/20 toluene: denatured ethyl alcohol, using sections of film previously dried for 1 hr. at 100° C. and kept in desiccator until weighed. A Ubbelohde viscometer[8] was employed. Surface crazing, color and haze were noted visually.

Table IV.—Flexibility of Stabilized[a] Ethyl Cellulose Films Exposed to Outdoor Weathering[b]

Stabilizer	*80 days*	*100 days*	*215 days*	*275 days*	*345 days*
Control (no stabilizer)	B	..	..	..	..
Hydroquinone monobenzyl ether	F	F	B	..	..
Syringic acid	F	F	F	B	..
Belro phenol lactone	F	F	F	F	B
Hydroquinone dibenzyl ether	F	B	..	..	..
p-Benzylcatechol	F	F	F	B	..
p-Hexylcatechol	F	F	F	F	B
p-Phenylphenol	F	F	F	B	..
p-tert-Butylphenol	F	B	..	..	..
p-phenyl salicylate	F	F	B	..	..
Menthylphenol	F	F	B	..	..

[a] All stabilized films contained 1 percent by weight of stabilizing agent added to N-100 ethyl cellulose.
[b] Code for flexibility observations: B = brittle and F = flexible.

Discussion of data

Preliminary work—In the preliminary investigation, a study was made of the effect contributed by a

[8] "Tentative methods of test for kinematic viscosity," Am. Soc. for Testing Materials, D 475–37T.

number of formulation variables. Of these, solvent composition, choice of resin, choice of plasticizer and use of an antioxidant appeared to be significant in having an effect on outdoor weathering.

It has been demonstrated[4] that physical properties such as flexibility, tensile strength and elongation of ethyl cellulose films can be greatly influenced by the type of solvent from which the films are cast, and that strong, flexible films resist weathering very much better than weak, brittle films. In general, flexible films of maximum tensile strength and flexibility are obtained when highly nonpolar solvents such as toluene, xylene butyl acetate or methyl isobutyl ketone, which have little or no affinity for water, constitute a major portion of the solvent at the moment that the film sets to a gel. Brittle films with relatively poor tensile strength and flexibility usually result when polar solvents, such as acetone or ethyl alcohol, which are miscible with water in all proportions, are present in major amounts at the moment of gelation. A suitable solvent mixture should contain not more than about 30 percent by weight of a low-boiling, water-miscible solvent; the remainder should consist of such solvents as toluene, xylene, "toluene substitute," butyl acetate, etc.

The solvent composition selected for this study and cited above, meets these requirements. It should also

[4] "Hercules ethyl cellulose, properties and uses," Hercules Powder Co., pp. 23, 24, Form 500-16 (March 1944).

Table V.—Flexibility, Viscosity Retention and Ethoxyl Content of Stabilized[a] and Unstabilized Ethyl Cellulose Film Exposed to Outdoor Weathering

Stabilizer	*Original film*		*Film exposed outdoors for 80 days*			*Film exposed outdoors for 275 days*	
	Flexibility[b]	*Ethoxyl*	*Flexibility*[b]	*Viscosity Retention*	*Ethoxyl*	*Flexibility*[b]	*Ethoxyl*
		percent		*percent*	*percent*		*percent*
Control (no stabilizer)	F	44.7	B	8	39.8	..	...
Belro phenol lactone	F	46.4	F	79	45.6	B	42.1
p-Phenylphenol	F	45.8	F	78	45.9	B	41.0

[a] The stabilized films contained 1 percent by weight of stabilizing agent added to N-100 ethyl cellulose.
[b] Code for flexibility observations: B = brittle and F = flexible.

be pointed out that combinations of ethylene dichloride and ethyl alcohol formed relatively brittle films. It is, believed that the poor behavior of ethyl cellulose in previous work[1] was at least partly due to improper selection of solvent for the preparation of the samples supplied to these investigators.

The most suitable resins proved to be phenolics, exemplified by Super-Beckacites 1001 and 2000, Amberol ST-137, Durez 500 and others of a similar type. Rosin esters such as ester gum and maleic-modified ester gum, and natural resins such as dewaxed Batavia dammar, manila gum, kauri, etc., were poor for outdoor durability.

The most significant factors affecting outdoor durability of clear ethyl cellulose plastic sheets were choice of a suitable plasticizer and use of an antioxidant. The remainder of this article is devoted to a discussion of these two factors.

Plasticizers—Table I (page 155) gives Fade-Ometer exposure data from a large number of tests of plasticized ethyl cellulose compositions. These data bring out clearly how (*Please turn to page 246*)

Table VI.—Outdoor Weathering[a] of Ethyl Cellulose Films[b]

Film no.	*Secondary plasticizer*	*Stabilizer (1 percent)*	*Condition[c] after weathering for:*							
			75 days	*120 days*	*200 days*	*250 days*	*300 days*	*385 days*	*450 days*	*500[d] days*
1	Unplasticized	None	OK	Crumbling	Disintegrated	...	...	...	Disintegrated after 120 days	...
2	Triphenyl phosphate	None	OK	OK	OK	V. Sl. haze	V. Sl. haze	Crazing	V. bad crazing	V. V. bad crazing, translucent
3	Triphenyl phosphate	Menthylphenol	OK	OK	OK	V. Sl. haze	V. Sl. haze	Sl. haze	Bad crazing	V. bad crazing, fair clarity
4	Triphenyl phosphate	Age-Rite Alba	OK	OK	OK	Crazing	Crumbling	Disintegrated	...	...
5	Triphenyl phosphate	Belro phenol lactone	OK	OK	OK	V. Sl. haze	V. Sl. haze	Bad crazing	V. V. bad crazing	V. V. bad crazing, translucent
6	Triphenyl phosphate	*p*-Phenylphenol	OK	OK	OK	V. Sl. haze	V. Sl. haze	Bad crazing	Crumbling	Disintegrated
7	Diphenyl phthalate	None	OK	OK	OK	V. Sl. haze	Sl. surface craze	Bad crazing[e]	V. V. bad crazing, V. hazy[e]	V. V. bad crazing, V. bad clarity[e]
8	Diphenyl phthalate	Menthylphenol	OK	OK	OK	V. Sl. haze	Sl. surface craze	Crazing[e]	V. bad crazing, V. hazy[e]	V. bad crazing, V. bad clarity[e]
9	Diphenyl phthalate	Age-Rite Alba	OK	OK	OK	V. Sl. haze	Crazing	V. bad crazing[f]	V. V. bad crazing, V. hazy[e]	V. V. bad crazing, V. bad clarity[e]
10	Diphenyl phthalate	Belro phenol lactone	OK	OK	OK	V. Sl. haze	Sl. surface craze	Crazing[e]	V. bad crazing, V. hazy[e]	V. bad crazing, V. bad clarity[e]
11	Diphenyl phthalate	*p*-Phenylphenol	OK	OK	OK	V. Sl. haze	Sl. surface craze	Crazing[e]	V. V. bad crazing, V. hazy[e]	V. V. bad crazing, V. bad clarity[e]
12	Pentaphen	None	OK	OK	OK	V. Sl. haze	V. Sl. haze	Sl. haze	Sl. crazing	V. bad crazing, fair clarity
13	Pentaphen	Menthylphenol	OK	OK	OK	V. Sl. haze	V. Sl. haze	Sl. haze	Sl. crazing	V. bad crazing, fair to good clarity (second best)
14	Pentaphen	Age-Rite Alba	OK	OK	OK	V. Sl. haze	Sl. craze	Sl. craze[f]	Sl. crazing[f]	V. bad crazing, fair clarity[e]
15	Pentaphen	Belro phenol lactone	OK	OK	OK	(Best in group)	(Best in group)	Sl. haze	Sl. crazing (best)	Sl. crazing, good clarity (best)
16	Pentaphen	*p*-Phenylphenol	OK	OK	OK	V. Sl. haze	V. Sl. haze	Sl. haze	Sl. crazing	V. bad crazing, fair clarity
17	Methylphenol	None	OK	OK	OK	V. Sl. haze	V. Sl. haze	Sl. crazing	Bad crazing	V. bad crazing, fair clarity
18	Menthylphenol	Age-Rite Alba	OK	OK	OK	V. Sl. haze	V. Sl. haze	Crazing[f]	V. bad crazing[f]	Disintegrated

[a] Exposure of the films was started June 22, 1945. [b] The composition of the films was 80:14:6 ethyl cellulose N-100: tricresyl phosphate: secondary plasticizer. [c] Code for abbreviations: V. = very and Sl. = slight. [d] All films cracked when subjected to pinch test. [e] Yellowing. [f] Slight yellowing.

Tenite steering wheel for leading makes of trucks and buses, manufactured by Sheller Mfg. Corp., Portland, Ind.

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TENITE AN EASTMAN PLASTIC

Plastics Digest

This digest includes each month the more important articles of interest to those who make or use plastics. Mail request for periodicals directly to publishers.

General

SWEET PLASTICS STORY. Chemical Industries *60*, 767 (May 1947). The synthesis and properties of allyl sucrose, a varnish resin made from sugar, are reported in this article.

BETTER THAN NYLON? Chemical Industries *60*, 764–5 (May 1947). The ideas which led to the synthesis of Terylene, a new British development in the synthetic fiber field, are reported. This new resin is a superpolyester made from terephthalic acid condensed with ethylene glycol. It has a high melting point, is resistant to water, can be spun and drawn into a strong fiber, has high initial modulus of elasticity, has high wet strength, behaves like a heavy spring, is resistant to molds and bacteria, stable to light.

Materials

NEW PROCESS FOR ACRYLIC RESINS. R. W. Porter. Chem. Eng. *54*, 102–6 (Apr. 1947). A new process for synthesizing methyl methacrylate monomer from acetylene and acetone is described. The acetylene and acetone are condensed to dimethylhexinediol in the presence of alkali and the diol oxidized to α-hydroxyisobutyric acid which is dehydrated to give methyl methacrylate. The monomer is polymerized to transparent sheet form by a new process utilizing organic peroxides other than benzoyl as catalysts. The synthesis and polymerization methods are described in detail.

POLYVINYL BUTYL ETHER. V. V. Korshak and V. A. Zamyatina. J. Gen. Chem. (U.S.S.R.) *15*, 947–51 (1945); Chem. Abstracts *40*, 6882 (Nov. 10, 1946). The polymerization of vinyl butyl ether in the presence of various Friedel-Crafts catalysts between −55 and 60° C. was investigated. Stannic chloride is the most active, followed by boron trifluoride, ferric chloride and aluminum chloride. The most reproducible results were obtained with ferric chloride. Aluminum chloride gave colored products. All the polymers were viscous sticky liquids. They are soluble in diethyl ether and benzene and insoluble in ethanol and water. The molecular weights were all under 5000, th maximum obtained with stannic chloride at 30° C. The polymer is a 1,3 glycol since the oxidation with nitric acid gave butyric and oxalic acids. Hydrolysis with acids gave tars while hydrolysis with alkalis produced polyvinyl alcohol. A mixed acetate-butyl ether of polyvinyl alcohol was produced by heating the polymer with a mixture of acetic acid, acetic anhydride and disodium phosphate.

THERMOSETTING RESIN HAS HIGH REFRACTIVE INDEX. Chem. Eng. News 25, 2030 (July 14, 1947). A new thermosetting resin, V-Lite, is described. It is a polymer of diallyl phenyl phosphonate. The monomer also copolymerizes with many other monomers. The polymer has a refractive index of 1.57, is hard, is not soluble in most organic solvents, is not attacked by strong alkalis and acids and is flame resistant.

Plasticizers

EFFECT OF PLASTICIZERS ON THE SECOND-ORDER TRANSITION POINTS OF HIGH POLYMERS. R. F. Boyer and R. S. Spencer. J. Polymer Sci. 2, 157–77 (Apr. 1947). This is a review article concerned with the effect of plasticizers on the second-order transition point and related phenomena in high polymers. The second-order transition temperature behavior of plasticized polymers can be described by a linear relationship between the square root of the weight fraction of polymer and the reciprocal transition temperature. For certain temperature regions and plasticizer contents, this is mathematically equivalent to the linear decrease of transition temperature with plasticizer content which is also observed experimentally. This latter result is in accord with Zhurkov's theory of the softening action of solvents, which predicts a linear decrease in softening temperature with solvent content and no dependence on the nature of the solvent. Neither the second-order transition approach nor Zhurkov's theory permits conclusions about the nature of the plasticizer. However, it is shown empirically that brittle temperature can be represented as a function of the solvent-polymer interaction constant by a curve having a maximum at 0.4. Since this constant is also the parameter which measures compatibility, it is seen that the efficiency and the compatibility of a plasticizer are intimately related. Moreover, correlation can be made with older observations showing the relation between efficiency and the temperature coefficient of viscosity of the plasticizer.

INTERNAL PLASTICIZATION: EFFECT OF CHEMICAL STRUCTURE. V. L. Simril. J. Polymer Sci. 2, 142–56 (Apr. 1947). The elastic and plastic properties of high polymeric materials are functions of the forces holding the molecules together and the ability of small segments of the chains to move about, relative to other segments. Internal plasticization is accomplished by introducing structural features which reduce intermolecular and intramolecular forces and which, in general, decrease the order of the polymer. Physical techniques used to determine the effect of such structural features are discussed. The results of numerous investigations into the relations between structure and properties are considered in an attempt to present a simple and consistent physical picture of these relations.

Applications

ACID PROOF BOTTLES. Canadian Plastics *5*, 16 (June 1947). Bottles for holding hydrofluoric acid are molded of polystyrene.

TEXTILE BAGS. Modern Packaging *20*, 140–2 (May 1947). Applications of laminated and treated cotton textile bags are described.

VULCANIZED FIBRE IN TOOLS, JIG AND FIXTURE CONSTRUCTIONS. E. E. Halls. Plastics (London) *11*, 270–80 (May 1947). The properties and uses of vulcanized fibre in tool, jig and fixture construction are reviewed.

Coatings

TETRAHYDROFURAN. Chemical Industries *60*, 766 (May 1947). The synthesis and possible uses of tetrahydrofuran are reported. It is used as a nylon intermediate and has superior properties as a solvent for rubber and resins.

EMULSION PAINTS. G. M. Sutheim. Chemical Industries *60*, 948–51, 1063 (June 1947). The principles, formulation and applications of emulsion coatings are discussed. Films of many resins may be made by this technique. Fifty-five references.

SOLVENTLESS VARNISHES FOR ELECTRICAL INSULATION. H. W. Chatfield. Plastics (London) *11*, 78–84 (Feb. 1947). Solventless varnishes for electrical insulation consist of plastic monomers or liquid resins which are polymerized in situ. Polymerization to a solid state is effected by catalysts or heat or both. The advantages and disadvantages of both types of varnishes are discussed.

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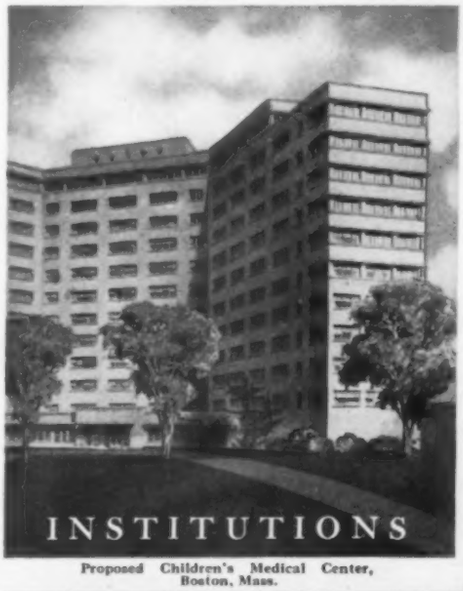

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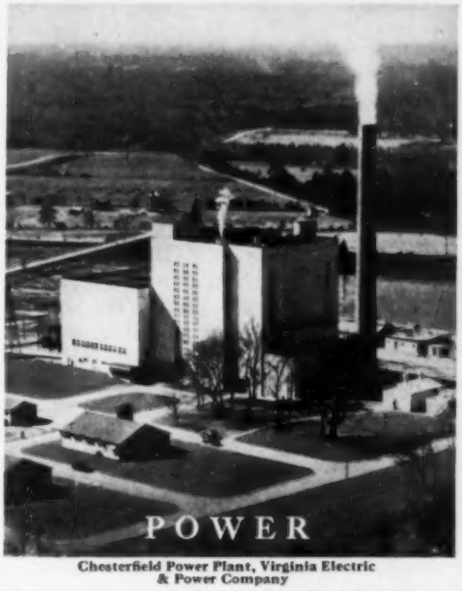

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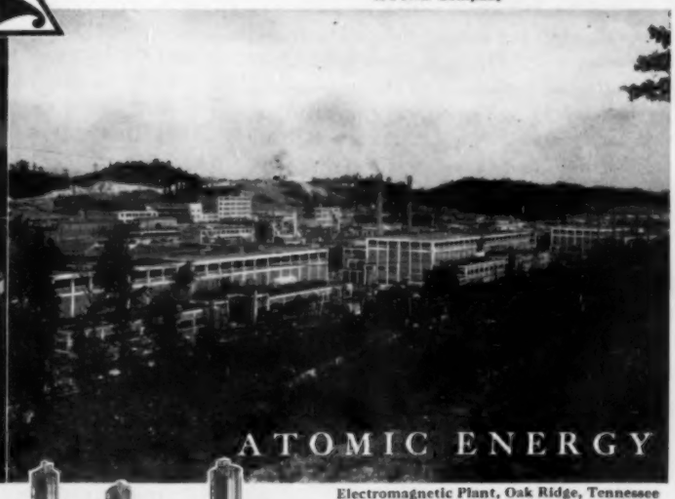

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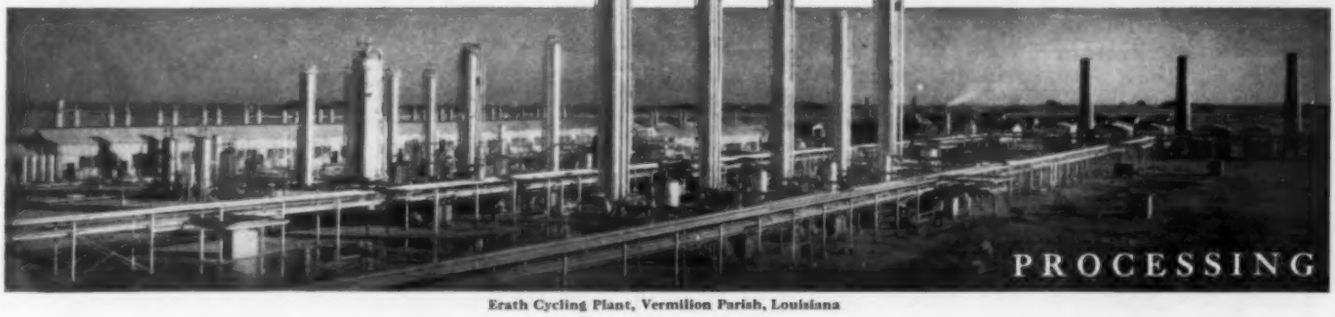

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Technical Briefs

Abstracts of articles on plastics in the world's scientific and engineering literature relating to properties and testing methods, or indicating significant trends and developments.

Chemistry

REACTION OF THIOPHENE WITH FORMALDEHYDE AND SALTS OF HYDROXYLAMINE. H. D. Hartough. J. Am. Chem. Soc. *69*, 1355–8 (June 1947). Various amines are obtained when hydroxylamine hydrochloride and formaldehyde react with thiophene. These amines lose water readily to form imine type compounds which polymerize rapidly to resinous products.

CATALYTIC POLYMERIZATION OF *n*-BUTYL VINYL ETHER. D. D. Eley and D. C. Pepper. Trans. Faraday Soc. *43*, 112–19 (Mar. 1947). The polymerization of *n*-butyl vinyl ether, catalyzed by stannic chloride, possesses certain novel features which differentiate it from the usual radical type polymerizations. It can proceed with explosive vigor at room temperatures, and the rate curve, even in purified solvent, is characterized by a period of induction, followed by an accelerating rate. There is thermal evidence for polymerization to short chains during the induction period and the molecular weight of the polymer grows during the reaction. This and other evidence is in harmony with a set of three successive reactions 1) initiation, 2) propagation, 3) termination, in which (1) is relatively more rapid and (2) relatively slower than for radical polymerizations. The active intermediate is probably a complex of stannic chloride with the polymer, in which the terminal double bond is polarized. On termination the stannic chloride is set free in order to activate further monomer.

Properties

FREE ENERGY, HEAT AND ENTROPY OF SORPTION OF WATER VAPOR BY PROTEINS AND HIGH POLYMERS. M. Dole and A. D. McLaren. J. Am. Chem. Soc. *69*, 651–7 (Mar. 1947). Equations for the free energy of adsorption or sorption of any substance in terms of the constant of the linear, Langmuir and Brunauer, Emmett and Teller adsorption isotherm equations were derived for both the differential and integral free energies. Similar equations for the differential net heats (isosteric heats) are also given. Data of Bull on the amount of water sorbed by proteins and nylon were recalculated to yield differential free energies and differential and integral net heats of sorption different from those discussed by Bull, but in the case of the integrated free energy data, equal to the previously published values of Bull. The average differential heats over the first layer graphically computed from Bull's data are much higher than calculated from the constant *c* of the Brunauer-Emmett-Teller theory. The fraction of polar groups associated with one water molecule at saturation is shown to be equal to the fraction of amorphous polymer in unstretched and stretched nylon. As the initial differential heats vary widely for sorption on chemically similar polar groups, the structural configuration of the groups must be considered.

IMPACT STRENGTH OF PLASTIC MATERIALS. M. G. Charlton and S. N. Farmer. British Plastics *19*, 208–11 (May 1947). A rapid method is described for determining the impact strength at various temperatures of short pieces of plastic of circular cross-section. A short piece of metal rod with a rounded end is dropped down a tube. Pins are mounted on the side of the falling piece to prevent rotation. A linear relation between cross-sectional area and impact strength is confirmed. The influence of anvil is shown. Impact strength increases when the length of the test-piece is below a certain limit and there is some indication of a decrease when the velocity of impact is raised.

Testing

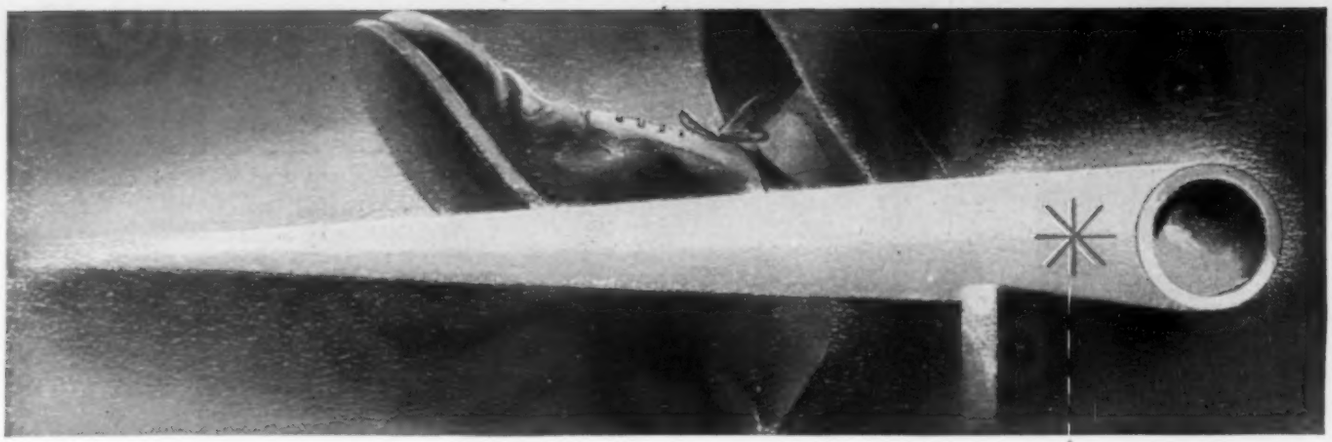
DETERMINATION OF VINSOL RESIN IN PORTLAND CEMENT. L. Bean and R. B. Peppler. Rock Products *49*, No. 7, 71–3, 108–10 (1946). Vinsol resin in portland cement is determined by extracting with chloroform or from calculations of the methoxyl content. The chloroform method gives more accurate results.

DETERMINATION OF THE GAS PERMEABILITY OF SARAN FILMS. T. W. Sarge. Ind. Eng. Chem., Anal. Ed. *19*, 396–400 (June 1947). A modified manometric apparatus for measuring gas permeabilities of films having extremely low transmission characteristics is described. Experimental results of equilibrium transmission for Saran films measured by a variable pressure technique are reported. Over-all results for Saran film gas transmissions are lower than those generally encountered in the literature for any organic film material. The self-consistency of results observed with the present apparatus, the relationships observed and the behavior of several gases under various pressure differentials are discussed. The permeabilities at 25° C. of helium, hydrogen, oxygen, acetylene, air, propane, ethylene, ethane, methane, nitrogen and carbon dioxide through Saran films, 0.0005 and 0.0028 in. thick, are reported.

Synthetic rubber

THE SOLUBILITY OF GASES IN ELASTOMERS. R. M. Barrer. Trans. Faraday Soc. *43*, 3–11 (Jan.-Feb. 1947). A simple extension of the statistics of liquid-elastomer mixtures gives explicitly the sorption isotherm of gases in elastomers at temperatures above their critical temperatures. This isotherm was used to compare the experimental and theoretical solubility constants of several permanent gases in various elastomers, with good agreement. Isotherms of a number of vapors in rubber were also calculated. In the case of the benzene-rubber system the actual data are very successfully reproduced by the isotherm derived from Miller's equation which assumes random mixing. Other mixtures which do not deviate greatly from this isotherm were chloroform-rubber, *n*-heptane-rubber and toluene-rubber. Orr's equation was moderately successful in giving the isotherm for acetone in rubber, a system in which a larger endothermal heat of mixing of liquid and rubber causes departures from random mixing and results eventually in a two-phase system at a critical composition. An equation of Huggins in this case led to a satisfactory isotherm.

ELASTIC LOSSES IN SOME HIGH POLYMERS AS A FUNCTION OF FREQUENCY AND TEMPERATURE. H. S. Sack, J. Motz, H. L. Raub and R. N. Work. J. Applied Phys. *18*, 450–6 (May 1947). The temperature and frequency dependence of the elastic losses of polyvinyl chlorides (0 to 80° C., 60 to 1400 c.p.s.) and of natural rubber and butadiene-styrene copolymers of different relative concentration (−50 to 35° C., 20 to 3500 c.p.s.) was studied by three methods, in which the motion of a reed in free or forced vibration is observed. Natural rubber at temperatures above 20° C. and polyvinyl chloride exhibit frequency independence losses, the mechanism of which is not yet clear. The results for rubber below 20° and for GR-S can be explained by a relaxation theory. The behavior of the elastic losses also reflects the existence of a second-order transition, below which rotation of chain segments is hampered.



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U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25 cents each.

SHOE SOLE. J. M. Bierer (to Boston Woven Hose and Rubber Co.). U. S. 2,419,387, Apr. 22. A shoe sole having a body of resinous material.

BOBBIN. A. Morf. U. S. 2,419,415, Apr. 22. A textile machine accessory of bobbin-like configuration comprising a hollow tubular body portion of injection-molded artificial resin provided with internal splines, a metal cap and an external metal ferrule.

GARMENT HANGER. S. Behr. U. S. 2,419,435, Apr. 22. A plastic garment hanger.

LAMINATE. J. Delmonte (to E. F. Lougee and Hemphill Co.). U. S. 2,419,440, Apr. 22. A laminated structure is prepared by mixing melamine-formaldehyde and plaster-of-Paris, adding sufficient water to prepare an adhesive paste-like mass, applying the paste and glass cloth in alternate layers upon a suitable form and adhering and solidifying under atmospheric temperature and pressure.

SHAPING MOLD. J. H. Brown, U. S. 2,419,532, Apr. 29. A shaping mold for gluing sheets of material together in laterally offset relation.

COATED PLYWOOD. A. R. Welch. U. S. 2,419,614, Apr. 29. A plywood product comprising veneers adhesively joined together into a panel with at least one outer ply having fissures, cracks and other imperfections in its outer surface and a continuous layer of substantial thickness of a mixture of synthetic resin and discrete wood particles, said layer being of sufficient thickness to fill the fissures, cracks, etc., yet presenting a smooth outer surface, said layer being cured under heat and pressure.

CONDENSATE. A. W. Sloan (to B. F. Goodrich Co.). U. S. 2,419,735–6, Apr. 29. A composition comprising a mixture of alkylated diarylamine with a composite condensate prepared by heating a conjugated diolefin containing less than eight carbon atoms with a diarylamine at a temperature of 50 to 300° C. in the presence of an acidic condensation catalyst.

MOLDING CONTAINERS. P. Crosley III. U. S. 2,419,765, Apr. 29. Containers are prepared by forming a tubular member of resin-impregnated fibrous material having an aperture therein, assembling in said aperture another member of said material having a surface contacting a surface of said body member adjacent to said aperture, coating prior to assembling the contacting surfaces with a layer of partially reacted thermosetting resin and pressing the contacting surfaces together while simultaneously subjecting to heat to fuse and cure the resin.

RESIN DISPERSIONS. C. F. Brown (to U. S. Rubber Co.). U. S. 2,419,816, Apr. 29. An aqueous dispersion of synthetic resin such as polymers of vinyl chloride, vinyl chloride and vinyl acetate, or alkyl methacrylate is prepared by mixing therewith a plasticizer; a heat reaction product of a mixture of a rosin, an alkanolamine, an alkylene glycol and a dimerized acid of a vegetable drying oil; a hydrophilic colloidal dispersing agent such as a soap, a protein, solubilized casein or colloidal clay; and adding water until an inversion of phase occurs.

PLYWOOD ADHESIVE. L. L. Blyler, J. W. Clough, C. W. Hawley, and E. C. Pitman (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,419,880, Apr. 29. A laminated article having a plurality of cellulosic plies bonded by an adhesive comprising the reaction product of a hydrolyzed interpolymer of styrene, maleic anhydride and hydrolyzed polyvinyl acetate.

POLYMERS. W. J. Burke (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,419,943, May 6. Sulfur-containing materials are prepared by reacting an ethylenically polyunsaturated macromolecular polymer having an iodine number of at least 25 with a monocarbothiolic acid in the presence of a peroxy catalyst until at least one mol of the acid is introduced per 4 ethylenic linkages.

COVER PLATE. W. C. Linton (to Fuse Indicator Corp.). U. S. 2,420,000, May 6. A combined escutcheon for electrical outlets and lamp housing assembly therefor molded from plastic insulating material.

CIGARETTE PACKAGE. I. E. Cohn. U. S. 2,420,031, May 6. A holder for a cigarette package fabricated from transparent, tinted plastic sheet.

BITUMINOUS COMPOSITION. E. W. Klinger (to Standard Oil Development Co.). U. S. 2,420,082, May 6. A petroleum bituminous composition comprising an asphalt and an oil-soluble polymerized aliphatic ester of methacrylic acid.

BENDING MOLD. R. M. Boehm and A. A. Ladon (to Masonite Corp.). U. S. 2,420,119, May 6. Apparatus for bending sheet material.

COATING. C. H. Hempel and F. J. Ploederl (to Heresite and Chemical Co.). U. S. 2,420,134, May 6. A resinous coating comprising an oil-free polymerizable phenol-formaldehyde resin completely dissolved in a solvent comprising steam-distilled pine oil, ethyl alcohol and butyl alcohol.

TEXTILE FINISHING H. J. West (to American Cyanamid Co.). U. S. 2,420,157, May 6. Textiles are finished by impregnating with an aqueous solution of a quaternary ammonium salt of a melamine-formaldehyde condensate and heating to a temperature above 80° C. to decompose the salt and set the resin.

POLYMER. L. M. Richards (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,420,194, May 6. The process comprising reacting in solution in an inert solvent a polymeric organic compound having a plurality of ethylenic linkages with a carbothiolic acid.

EAR MUFFS. S. Hurst. U. S. 2,420,245, May 6. An earmuff comprising molded plastic backing and a pad having its margins folded over said flange.

SHEETING MEANS. T. S. Carswell (to Monsanto Chemical Co.). U. S. 2,420,284, May 6. A block of thermoplastic vinyl aromatic material is sheeted by heating to the transition temperature and cutting while maintaining said temperature.

COPOLYMER. L. C. Shriver and G. H. Fremon (to Carbide & Carbon Chemicals Corp.). U. S. 2,420,330, May 13. An acetone-soluble copolymer of vinyl chloride and acrylonitrile, 0.1 gram of which in 50 ml. of acetonylacetone has a specific viscosity at 20° C. of between 0.1 and 0.6, said copolymer being formed by copolymerizing a mixture of monomers in the ratio of 5.06 to 49.0 parts of monomeric vinyl chloride to one part of monomeric acrylonitrile.

ADHESIVE TAPE. H. C. Geen (to Haskelite Mfg. Corp.). U. S. 2,420,366, May 13. A tape adapted to secure together the margins of a sheet of wood veneer or a split therein, comprising a thin paper film impregnated with alkali-condensed phenol-formaldehyde resin, one face of which has a coating consisting of a solid solution of alkali-condensed phenol-formaldehyde resin in polyvinyl alcohol, the coating being actuatable by moisten-

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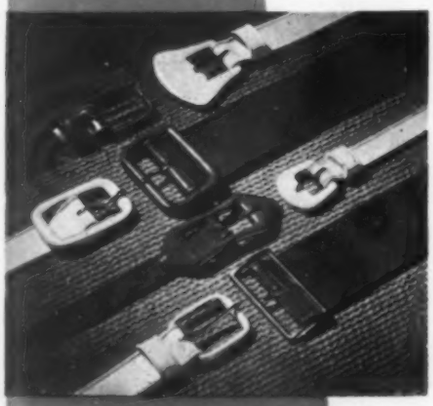

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ZEIN COMPOSITION. L. D. Myers (to Emery Industries, Inc.). U. S. 2,420,381, May 13. A zein composition comprising plasticized zein containing a half ester of a dicarboxylic acid having 4 to 18 carbon atoms and a monohydric alcohol having 1 to 12 carbon atoms as the plasticizing agent.

COATING. T. C. Whitner (to Chemical Laboratories, Inc.). U. S. 2,420,390, May 13. A coating composition comprising a drying oil; a pigmenting agent, comprising a drying oil-insoluble condensate of a saturated acyclic aldehyde with a saturated acyclic ketone and containing an adsorbed dye; and a drying agent for oil.

MOLDING PRESS. A. L. Alves (to Watertown Mfg. Co.). U. S. 2,420,405, May 13. In hydraulic press for molding plastic material under pressure, a pair of cooperating upper and lower mold sections one being movable relative to the other, the lower having a transfer chamber extending to the parting line.

ION-EXCHANGE RESINS. J. R. Dudley (to American Cyanamid Co.). U. S. 2,420,419, May 13. A process for removing cations from fluid media comprising treating with a granular water-insoluble composition having a particle size of less than 8 mesh and comprising the hydrolyzed reaction product of a mixture including furfural and a mineral acid halide such as sulfuryl chloride or phosphorus oxychloride, and separating the fluid from said water-insoluble composition.

ARTICLE FORMING. D. G. Rempel. U. S. 2,420,443, May 13. Hollow articles are prepared by building one or more plies of heat-bonding, fluid-pressure-impervious material on a collapsible form, building one or more additional plies of heat-bonding material on said form to preform an article closely to the outside shape and size of the finished article, sealing the opening provided for admitting pressure fluid to the interior of the article, heat-curing the preformed article, removing the article from the mold and collapsing the form and removing the same from article through said opening.

POLYAMIDE PHOTOGRAPHIC EMULSIONS. W. W. Watkins (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,420,455, May 13. A water-soluble silver salt is incorporated in an aqueous-alkanol solution containing a water-sensitive polyamide, admixing an aqueous solution of a water-soluble halide, digesting the emulsion at a temperature of 80° C. for several hours, casting into films, washing said films, redissolving in an aqueous-alkanol solution and coating said solution onto a support, said polyamide being insoluble in water at 20° C. but soluble to the extent of at least 10 percent at 60° C. in an ethanol-water solution.

STORAGE BATTERY PLATES. C. C. White (to Electric Storage Battery Co.). U. S. 2,420,456, May 13. In a storage battery plate, the combination of a conducting member, active material on said conducting member and a fabric envelope composed of molecularly oriented and mutually unattached threads of synthetic resin resistant to the powerful oxidizing and electrochemical reactions in a storage battery, said envelope enclosing said conducting member and said material thereon and shrunken to grip said material firmly and provide a retainer of reduced porosity therefor.

LAMINATED STRUCTURES. L. J. Marhoefer, W. A. Taylor and E. L. Vidal (to Vidal Corp.). U. S. 2,420,488, May 13. The method of producing a hollow member whose surface is in part of a configuration in which all elements are non-rectilinear, said member including a multi-ply shell and a separate nose piece, said method comprising provision of form complementary to the shape of the member, cutting from sheet material groups of planar units, placing said units on the form in edge-to-edge relationship with adhesive between each ply, subjecting the assembly to a shaping and bonding operation and finally withdrawing said form from the member.

CELLULOSE ESTERIFICATION. A. Ruperti (to Society of Chemical Industry in Basle). U. S. 2,420,499, May 13. In the continuous esterification of cellulose with retention of its structure the method comprising separating the impregnated material from excess acid anhydride following impregnation therewith and subjecting to the action of hot circulating gas which is inert to the reaction at a temperature of at least 100° C. until acylation is effected.

MOLDING. Le G. Daly. U. S. 2,420,522, May 13. The method of making a safety helmet from flat plastic impregnated unstretchable plastic material, comprising providing a plurality of pieces, each corresponding to the development of the helmet, but being larger in area to ensure overlapping, folding each to correspond to the desired shape, assembling to form a laminated preform, placing in a heated mold and pressing against the mold with the aid of a rubber member for period of time sufficient to cure resin.

TEXTILE ARTICLES. E. W. Rugeley, T. A. Field, Jr., and J. L. Petrokubi (to Carbide & Carbon Chemicals Corp.). U. S. 2,420,565, May 13. Synthetic fibers, fabrics and articles comprising stretched yarn composed of filaments formed of a vinyl resin resulting from the copolymerization of a vinyl halide with acrylonitrile, substantially all portions of which are free from acetone-insoluble portions and are dispersible in acetone at 50° C., said yarn having high tensile strength, high true elasticity and flexibility, crease resistance, electrical insulating properties and water resistance.

ARTIFICIAL DENTURES. M. S. Shapiro. U. S. 2,420,570, May 13. A composite artificial tooth having a face portion and an inner portion each composed of polymerized acrylic ester and each polymerized in situ to their polymerization condition, said face and inner portions having coalesced abutting faces, said tooth being free from feldspar, said face portion having a minor proportion of hardening material and being harder and less resilient than the inner portion.

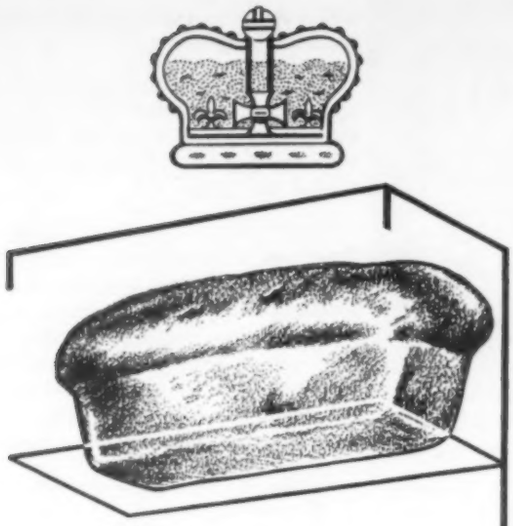
WARPING TAPE. O. H. Leidy (to Michigan Chrome & Chemical Co.). U. S. 2,420,604, May 13. An electrolytic protective flexible elastic tape comprising a generally homogeneous resinous ribbon-like strip having a generally glossy surface adherent to itself but capable of handling and having good tensile strength, said tape being of greater thickness in its central portion than at its edges whereby, when applied to and maintained under tension on an article to be treated and subsequently heat-treated, there results a fusing together of adjacent portions to provide a tight seal.

DECORATIVE MATERIAL. E. Norman. U. S. 2,420,614, May 13. Fusible transparent thermoplastic material is decorated by drawing a design on the surface thereof with a needle point element heated to the fusing temperature of the plastic, contemporaneously trapping gases or vapor bubbles in the dented and ridged portions to render the sections translucent, thereby providing a frosted appearance.

BUSHING. O. G. Odelius. U. S. 2,420,718, May 20. A seal construction adapted to seal a shaft relative to a stationary part, comprising a plastic composition bushing having an active sealing end face and means of clamping the bushing on the shaft.

COATED COMPOSITIONS. A. Pechukas and P. J. Gegner (to Pittsburgh Plate Glass Co.). U. S. 2,420,721, May 20. A method of providing a base with a synthetic resin surface comprising applying to a base a poly-unsaturated polymerizable ester which contains at least two polymerizable unsaturated groups separated by an ester linkage, said ester containing a polymerization catalyst for the ester, applying a coating of a water soluble film-forming material to the ester, polymerizing the ester and removing the water soluble film from polymerized ester.

POLYMER TREATMENT. D. W. Woodward (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,420,730, May 20. A process comprising reacting in sub-



Baked to the King's Taste

PRECISE and accurate control is an important factor in International's IMP-proved molding. In fact, it is so important to us at INTERNATIONAL that we have long used electronic equipment and cycle controllers on every molding job. This is typical of the painstaking care we use with every step involved in making your plastic part. It means that you get a good job at the right price. When your order goes to INTERNATIONAL it is handled as carefully as though it were the only order in the plant.

INTERNATIONAL MOLDED PLASTICS, INC.

4387 West 35th Street, Cleveland 9, Ohio

Chicago office: 20 N. Wacker Drive. Phone: Andover 5620 • New York office: 1270 Broadway. Phone: Pennsylvania 6-3290
Brockport (Rochester) office: 26 Allen Street. Phone: Brockport 134J • Detroit office: 510 Stephenson Building. Phone: Madison 5741
Philadelphia office: 941 Drexel Bldg. Phone: Walnut 3544 • St. Louis office: 718 Louderman Bldg. Phone: Garfield 2464

stantially anhydrous organic solvent and in the presence of an acidic catalyst, formaldehyde, an organic acid amide of a monoamine with an organic monobasic acid such as a carboxylic or sulfonic acid, and an organic soluble cellulose ester.

PIEZOELECTRIC MATERIAL. C. Chilowsky. U. S. 2,420,864, May 20. A piezoelectric plastic material is prepared by placing a quantity of finely divided piezoelectric crystals within a fluid body of plastic material, distributing the crystals uniformly throughout the plastic, solidifying the plastic, melting the crystals and recrystallizing and orienting the crystals in situ.

THERMAL INSULATION. C. H. Herter. U. S. 2,420,879, May 20. In a refrigeration unit the combination of a cabinet, a sliding door means providing a removable closure comprising a frame of insulation extending around the edge of the opening and a plurality of sheets of transparent material within the frame including a pane of glass forming the outer surface and a pane of synthetic resin having a lower thermal capacity than glass as the inner surface.

COPOLYMERS. G. F. Roedel (to General Electric Co.). U. S. 2,420,911, May 20. A resinous copolymer comprising the polymerizate of a mixture of methyl vinyl polysiloxane and methyl methacrylate.

ROSIN ESTERS. G. R. Anderson (to Hercules Powder Co.). U. S. 2,420,926, May 20. Hard, oil-soluble resins formed by the esterification of reactants consisting of rosin acids and polypentaerythritols having no more than three linked pentaerythritol nuclei.

CELLULOSE ETHERS. O. B. Hager and L. H. Bock (to Rohm & Haas Co.) U. S. 2,420,949, May 20. Shaped cellulosic products in the form of ribbons and films which have good wet strength and are insoluble in water and alkaline and acid solutions, comprising carboxyalkyl cellulose ether, the free acid form of which is soluble in alkaline solution and which contain zirconium attached to carboxyalkyl groups of the cellulose ether.

TEXTILE DECORATING. E. Armatys (to Interchemical Corp.). U. S. 2,421,000, May 27. A stable, pigmented, water-in-lacquer emulsion for use in textile decoration, the lacquer phase containing a vaporizable water-immiscible solvent containing as an emulsifying material, the condensate of formaldehyde and addition product of unsaturated fatty oil and an alpha olefinic dicarboxylic acid.

STRIP COATING. H. K. Ash (to Interchemical Corp.). U. S. 2,421,001, May 27. A stripping lacquer capable of depositing a permanently strippable film in a single spray application, characterized by a viscosity of 60 sec. in a No. 4 Ford Cup at 70° F., said coating consisting of cellulose acetate propionate, an alkyd resin, butyl acetate, ethyl acetate and hydroxyethyl acetate, said alkyd resin being prepared from sebacic acid, succinic anhydride, ethylene glycol and glycerol.

POLYMER. C. J. Frosch (to Bell Telephone Laboratories, Inc.). U. S. 2,421,024, May 27. A linear polymer containing cyclic imide groups is prepared by heating under condensation conditions a mixture of tricarballylic acid and a bifunctional reactant having a primary amino group and a hydroxyl or, as the other functional group, an amino group having at least one replaceable hydrogen.

ETHYL CELLULOSE. A. J. Warner and W. de C. Crater, Jr. (to Federal Telephone & Radio Corp.). U. S. 2,421,046, May 27. A plastic composition comprising ethyl cellulose plasticized with a liquid dimer, a solid dimer, a liquid trimer or a dehydrogenated liquid dimer of alpha-methyl para-methyl styrene.

LENSES. H. G. Hoffer. U. S. 2,421,065, May 27. A device for simultaneously cutting out and edging lenses made from an organic plastic material.

SHEET FORMING. E. M. Kratz (to Carbide & Carbon Chemicals Corp.). U. S. 2,421,073, May 27. In an apparatus for forming sheets from solution, a moving member having a surface to which the solution is delivered and a doctor blade for regulating the thickness of spread.

YARN SIZING. W. R. Haefele (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,421,122, May 27. A yarn-sizing composition comprising an aqueous solution of a water-sensitive hydroxylated polyvinyl resin and barium chloride, the latter serving to reduce the water sensitivity of the vinyl resin.

EXTRUSION DEVICE. H. T. Tornberg (to Modern Plastic Machinery Corp.). U. S. 2,421,132, May 27. In combination, a plastic extruder adapted to extrude a tubular shape, a slitting means positioned to slit the wall of the tube at a point after the tube leaves the die, an idler roller adapted to receive the slit tube in web form and a roller means adapted to receive said web.

LINER. C. E. Maier (to Continental Can Co., Inc.). U. S. 2,421,154, May 27. A flexible liner for beer containers comprising a non-metallic base having thereon an adherent coating exposed to the beer and consisting of water-insoluble and beer-non-reactive resin material containing aluminum powder as a filler.

TEXTILE TREATMENT. F. F. Pollak. U. S. 2,421,218, May 27. A non-flammable waterproof organic fiber material impregnated with a water soluble melamine salt of pyrophosphoric acid and coated with a melamine-formaldehyde condensation product.

SHOE UPPER. L. Pessak and R. Pessak. U. S. 2,421,353, May 27. In a shoe construction, a plurality of flexible tube members of plastic material comprising the uppers.

HEAT SEALING. J. Cozza (to American Viscose Corp.). U. S. 2,421,373, June 3. In an apparatus for heat-sealing thermoplastic materials in making bags, etc., the combination of a metal heat-sealing element having the surface covered with a smooth dry coating comprising film-forming hydrophilic material containing dispersed colloidal graphite.

CELLULOSE NITRATE ARTICLE. F. H. Reichel and R. T. Cornwell (to American Viscose Corp.). U. S. 2,421,391, June 3. In the denitration of an elongate article containing cellulose nitrate, the steps comprising treating with an alkaline solution of an alkali hydrosulfide as a reducing agent while maintaining the solution alkaline, but below a pH of 12 by means of a buffer.

POLYVINYL HALIDE. E. F. Brookman and S. F. Pearce (to Imperial Chemical Industries, Ltd.). U. S. 2,421,408, June 3. A polyvinyl halide composition which is rigid at 45 to 85° C. and which can be shaped at temperatures between 160 and 180° C., comprising a vinyl halide polymer mixed with a plasticizer and a chlorinated paraffin wax.

OPTICAL ADHESIVE. J. T. Rooney (to American Optical Co.). U. S. 2,421,436, June 3. An adhesive for joining optical elements comprising Canada Balsam mixed with ethyl cellulose.

PLASTIC FABRIC. E. Welti (to Hafner Associates, Inc.). U. S. 2,421,532, June 3. A loom for weaving fabrics of plastic material.

VULCANIZATION ACCELERATORS. E. W. Cook and E. O. Hook (to American Cyanamid Co.). U. S. 2,421,544, June 3. The process comprising vulcanizing rubber and sulfur-vulcanizable rubber-like materials in the presence of sulfur and a powdered resinous fusion product of zinc chloride, a monoaryl guanidine, paraformaldehyde and mercaptobenzothiazole.

FLEXIBLE COUPLING. G. A. Dalton (to John Waldron Corp.). U. S. 2,421,546, June 3. A gear-type flexible coupling comprising a pair of hubs adapted to be mounted on shafts and consisting of thermosetting plastic material and a cover of thermosetting plastic material.

TEETHING AID. M. F. Newmark. U. S. 2,421,574, June 3. A teething aid composed of resilient plastic material which is resistant to abrasion and boiling or freezing water.

when precision switches need rubber seals...

PERBUNAN

gets the job!

The rubber that seals precision switches is vital to the success of many electrical operations.

An excellent example of a control mechanism that requires a high-quality seal for dependable operation under a wide variety of operating conditions is the Die Cast Enclosed Switch produced by MICRO SWITCH DIVISION OF FIRST INDUSTRIAL CORPORATION. This switch is widely used for safety, limit and other control applications on machine tools and industrial equipment. It features ruggedness, light weight, compactness, high electrical capacity, reliability, ease of mounting and long operation life.

Function of the seal is to keep out moisture, dirt, oil and dust. The effectiveness of the seal in performing this function determines the reliability of operation of the switch. That's why "Micro" engineers, working with the rubber technologists of Acushnet Process Company, selected Perbunan as the logical material for this sealing application.

Both by test and by use Perbunan proves its exceptional ability to resist deterioration from abrasion, heat or cold, oil or water. And a new stabilizer has been added that keeps even delicate color shades constant...with no discoloration of the fluids or materials it contacts.

If you write to our nearest address, our experts will gladly assist on *any* rubber problem you have.

PERBUNAN
REG. U. S. PAT. OFF.

THE RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.; First Central Tower, 106 South Main Street, Akron 8, Ohio; 221 North LaSalle Street, Chicago 1, Illinois; 378 Stuart Street, Boston 17, Massachusetts. West Coast Representatives: H. M. Royal Inc., 4814 Loma Vista Avenue, Los Angeles 11, California. Warehouse stocks in Elizabeth, New Jersey; Los Angeles, California; Chicago, Illinois; Akron, Ohio; and Baton Rouge, Louisiana.

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Plastics Stock Molds*

SHEET ONE HUNDRED FIFTY-FOUR

These plastic novelties of many sorts are useful, decorative and amusing. The shade pull, soap saver, magnifying mirror, cereal spoon and picture frames find ready acceptance in the home. Other items such as the key chain, compact and water pistol will please or amuse various members of the household.

1778. This round magnifying mirror has a transparent plastic window. The frame, which is $4^{5}/_{16}$ in. in diameter, is molded.

1779. This attractive compact has a full vision mirror and a powder compartment. It measures $3^{1}/_{2}$ by $3^{1}/_{2}$ inches.

1780. This frame for round pictures is identical with the frame used for the magnifying mirror described in No. 1778. It is molded and has a diameter of $4^{5}/_{16}$ inches. The window is of a transparent plastic material.

1781. This cereal spoon which can be produced in a variety of gay colors will prove popular with the youngsters in the home.

1782. During the day time, this light or shade pull adds a decorative touch. At night, it does away with fumbling and groping in the dark, for it is luminous.

1783. These dainty birthday cake candle holders can be made in shades to blend with festive frosting.

1784. Pictures which are $2^{1}/_{4}$ by $2^{1}/_{4}$ in. can be held in this picture frame. The back is so made that the picture can be hung on the wall or rest on a desk top.

1785. This Koin-Keg has a double duty. It has a key chain for keys and a spring action dispenser for holding nickels.

1786. Cross, $4^{1}/_{2}$ in. high, is luminous.

1787. Another holder for photographs—this time a bow knot locket pin with a transparent window.

1788. Both sides of the photograph case which accompanies this key chain, are transparent and very slightly domed.

1789. A favorite weapon for boys is this water pistol. It is of the self-loading, multiple-shot type.

1790. Soft soap and corresponding waste are things of the past with this soap saver. It sits in soap dish so that soap rests atop cones for drying. It is $2^{1}/_{4}$ by $3^{5}/_{8}$ inches.

1791. This belt clip key chain has a window which may be used for identification purposes or for insertion of a photograph.

1792. Here, a photo window is used to set off this money clip.

* Reg. U. S. Patent Office.

The names and address of the manufacturers who make these stock molds are listed on page 244.

CREATIVE ARTISTRY
TRANSFORMS
PLASTICS INTO GOLD or SILVER
Masterpieces in costume jewelry—spray pins, lapel pins, earrings, and barrettes—can be made of plastics or various types of metals. Exquisitely plated in brilliant gold or silver.
Interstate's finishing process sheathes the surface of molded plastics or metal to produce striking costume pieces of unusual beauty.
Interstate products co.
160 FIFTH AVENUE, NEW YORK 10, N. Y.
WAtkins 9-3030-1, 2, 3, 4

Our huge new H. P. M. 16-oz. Injection Molding Machine is now in operation. All inquiries will receive prompt attention.

MARTINDELL MOLDING COMPANY
North Olden at Sixth
TRENTON 2, NEW JERSEY
NEW YORK OFFICE—1182 BROADWAY

Plastics

INJECTION MOLDING
COMPRESSION MOLDING
TRANSFER MOLDING

PHENOLIC UREA CELLULOSE ACETATE AND POLYSTYRENE MATERIALS.

Here's how Speed Nuts really cut costs!

COST REPORT

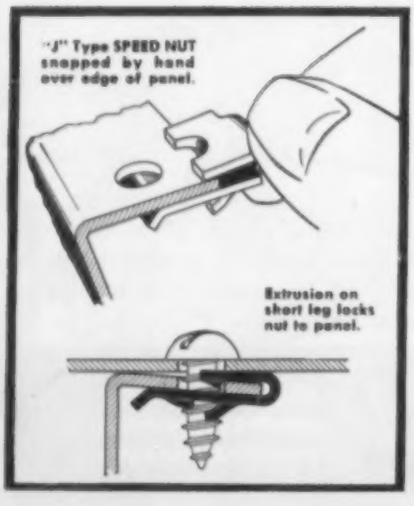
ITEM: Fastening Rear Fenders To Body

DESCRIPTION	No. per car	Material	Direct Labor	Overhead	Mfg. Cost
Cage Nut (Welding Type)	18	.1512			.1512
Bolt (5/16 - 18 x 1)	18	.0918			.0918
Lock Washer	18	.0072			.0072
Plain Washer	18	.0234			.0234
Spot weld 9 welding nuts to R & L Wheelhouse Panels			2200	.3850	.6050
Assemble R & L Fenders to Body			.1800	.3150	.4950
TOTAL for Welding Nut		.2736	4000	.7000	1.3736
Speed Nut ("J" Type)	18	.1116			.1116
Bolt (5/16 - 10 x 5/8)	18	.0828			.0828
Plain Washer	18	.0234			.0234
Attach 9 Speed Nuts to R & L Wheelhouse Panels			.1100	.1925	.3025
Assemble R & L Fenders to Body			.1350	.2363	.3713
TOTAL for Speed Nut		.2178	.2450	.4288	.8916
SAVINGS		.0558	.1550	.2712	.4820

Proof...that SPEED NUTS slash overhead and handling costs

- LOCK WASHER ELIMINATED
- SPOT WELDING ELIMINATED
- SPEED NUT COSTS LESS
- BOLT COSTS LESS
- LABOR COST IS LESS
- OVERHEAD IS LESS

Total saving for one operation using only 18 SPEED NUTS



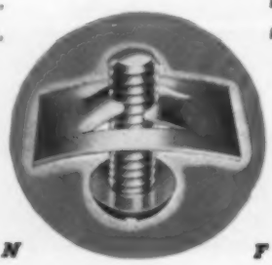
On this one simple operation, a prominent automobile manufacturer saved 48c per car by changing over to the SPEED NUT System of Fastening. Simple mathematics point out the phenomenal savings made possible by widespread use of SPEED NUT brand fasteners.

42c of this total was saved by reducing overhead and handling costs. With SPEED NUTS on the assembly line, welding machines were eliminated. Less floor space needed. Less material handling. Easier final assembly—and ⅓ of the men transferred to more productive work.

Look this report over carefully. Compare those direct labor and overhead charges and then drop us a line and find out for yourself what the SPEED NUT savings factor can do for you.

TINNERMAN PRODUCTS, INC. 2048 Fulton Road, Cleveland 13, Ohio

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessaires Simmonds, S. A., Paris
In Australia: Aerocessories, Pty. Ltd., Melbourne



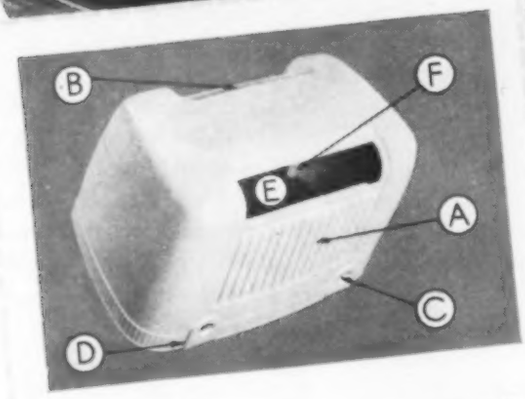
Speed Nuts* PATENTED

MORE THAN 4000 SHAPES AND SIZES

*Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS

RADIO CABINET OF IMPROVED UREA
molded by Aico



Molding Material
An improved urea-formaldehyde material was chosen for its rich, lustrous color, exceptional strength, light weight and smooth, hard finish.

Molding Method
Cases are compression molded in semi-automatic molds. Special pre-heating of the material speeds the molding cycle . . . reduces cost by increasing production.

Mold Design
The molds have been greatly simplified by designing the grill (A) so that it will draw, avoiding loose pieces in the mold. The molded-in handle (B) is made without moving parts in the mold. Holes (C) for control knobs are formed by movable core pins. Heavier cross sections (D) provide strength at points of stress. Close tolerances must be maintained at opening (E) which receives dial. Structural strength is increased by reinforcing ribs (F).

Write for Aico portfolio of file cards

Soft, lustrous Ivory finish . . . as it comes from the mold

For this new Bendix Radio Cabinet, *Aico* engineers recommended the use of an improved Urea Material . . . Its rich, Ivory finish is equally at home in the kitchen, drawing-room or boudoir . . . it will not chip, peel or discolor with age.

Because *Aico* engineers have had over 30 years of plastics experience, they were able to mold this cabinet from the *one* material which could provide the desired Ivory color. Perhaps you have been considering the use of Plastics to improve your product. Why not rely on a molder of *proven* ability to guide you! We will be happy to be of service.

AMERICAN INSULATOR CORPORATION
New Freedom, Pa.
SALES OFFICES: Cleveland — Detroit — New York — Philadelphia

AICO **PRECISION MOLDING**
For over 30 years

many things are better because of plastics

So Simple Anyone can
ENGRAVE
on Plastic and Metal

NEW HERMES PORTABLE

The handy, accurate machine that every plant NEEDS for speedy production lettering of name plates, small panels, novelties, serial numbers, part numbers, etc.

NEW HERMES, INC.
13-19 University Place • New York 3, N.Y.

COTTON FABRICS

FOR REINFORCING
PLASTICS

★

J. H. LANE & CO., Inc.
250 W. 57th St. • New York, N. Y.

Acetate jazz brush

Extruded cellulose acetate tube of this drummer's jazz brush holds its color, is warm and pleasant to the touch

A CELLULOSE acetate "jazz brush" has been added to the growing list of musical equipment which employs plastic materials. Cellulose acetate has replaced metal in two parts of the redesigned brush, fabricated by the L. A. Elkington Co., 323 E. 34th St., New York City.

The jazz brush is used by drummers for a "soft" effect on drums and cymbals. This type brush was developed by Mr. L. A. Elkington about 20 years ago after a series of experiments with a wire-brush fly swatter. At first steel was used for bristles and shaft, chromium plated brass for the tube, which serves as a handle as well as a protective covering for the bristles.

Permanent color, smooth touch

The use of cellulose acetate for the tube makes it possible to give permanent color to an instrument which must literally "take a beating." It also makes the handle warmer and more pleasant to the touch.

Yardley Plastics Co., 142 Parsons Ave., Columbus 15, Ohio, supplies the plastic tubing. The L. A. Elkington Co. flattens the end of the tube by hot stamping and attaches the white end plug with a swedge. The end plug is fabricated by Colonial Kolonite Co., 2212–16 W. Armitage Ave., Chicago 47, Ill. The manufacturer originally tried gluing the tube to the end plug but found a swedge simplified production, lasted longer.

The knob at the top of the shaft is made of wood. Thought was given to the use of cellulose acetate for this piece, but drummers who use the knob to beat on cymbals objected to the tonal qualities of plastic. The plastic tube, however, met with immediate acceptance.

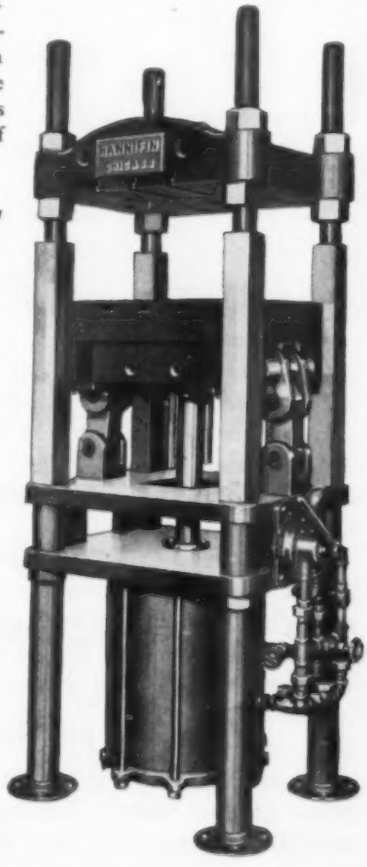
HANNIFIN

Designed and Built
to help YOU solve
your molding problems

● ADVANCED DESIGN. Hannifin molding press design is the product of more than thirty years of specialized experience. There is a difference. Hannifin presses—down to the last detail—are DESIGNED TO DO THE JOB!

● FASTER MOLDING. Exclusive Hannifin operating cycle for compression molding of small parts in multiple cavity molds: Rapid advance stroke...short power stroke at full capacity...rapid return stroke with full power to open molds. Operating speeds are adjustable.

● EASY TO INSTALL AND OPERATE. Small floor space needed. Connect to ordinary shop air supply at 80 to 100 lbs. pressure. Knockouts may be installed for top or bottom operation. Ideal for multiple unit installation—one man can handle as many as five presses depending on type of work.



DO YOU NEED
PRESSES
IN A HURRY?

DESPITE continued heavy demand for Hannifin platen presses, current delivery schedules are good. If you have to have presses in a hurry, wire or write the Hannifin factory.

● Model L-207 (illustrated); 50 tons capacity; $1,650.00.

● Model L-208; 15 tons capacity; $750.00.

See your local Hannifin representative for complete specifications and information, or write HANNIFIN CORPORATION, 1101 So. Kilbourn Ave., Chicago 24, Ill.

PLATEN PRESSES

in PLASTICS you've got to KNOW this

Scrap business!

We can offer reprocessed plastic materials which, for certain purposes, may be used to lower your production costs without lowering your quality.

If you wish to re-use your own scrap we can grind, magnetize, separate and rework it and return it to you clean and ready for use.

On the other hand, we will buy your thermoplastic scrap, rejected molded pieces and obsolete molding powder.

IT WILL PAY YOU TO CONSULT US.

CELLULOSE ACETATE • POLYSTYRENE • METHYL METHACRYLATE

A. BAMBERGER

44 HEWES STREET, BROOKLYN 11, N. Y.

PHONE ULSTER 5-3887 • CABLE CHEMPROD BROOKLYN

CELLULOSE ACETO-BUTYRATE • POLYVINYL RESINS, ETC

IN HANDY POWDER FORM

Gypsy

PLASTISOL DYES

15 standard colors
Perfect shelf life
No deterioration
Hot or cold dip
Better fastness
More even results

Now, with powder GYPSY PLASTISOL DYES and with newly perfected NYSOL you can compound your own dye solution for every popular plastic! NYSOL dissolves the dye, aids penetration, assures even dyeing. Mixed with solvents or water, per formulas furnished, dye is ready for instant use. Write for prices and full details.
Or—we are equipped to handle your dyeing problems in our own plant—roll or sheet film, molded pieces, extruded or cast shapes. Contact us.

New! Gypsy Cement! Non-inflammable, non-explosive. Clear or colored weld, solvent-type cement. For Plexiglass, Lucite, Polystyrene.

FREE TRIAL!

We'll prove Gypsy Plastic Dyeing is beautiful, practical. Send sample of plastic material and color desired. We'll dye it and include sample of Gypsy Plastic Cement to match. No obligation.

GYPSY DYES, INC.

Division of Wittie Mfg. & Sales Co., 1414 S. Wabash Ave., Chicago 5

FILLERS

WOOD FLOUR
COTTON FLOCK
and FABRICS
OF SUPERIOR QUALITY
FOR THE
PLASTIC INDUSTRY

LARGEST DOMESTIC SUPPLIERS

BECKER, MOORE & CO., INC.
NORTH TONAWANDA, N. Y.

PHOTOS, COURTESY PLASTICS MFG. CO.

Widely varied are possible designs and color combinations of these edge-lighted advertising plaques, that take advantage of the light-piping characteristics of acrylic

Birth of an idea

GOING ON the theory that one good application is deserving of another, Plastics Mfg. Co., 825 Trunk Ave., Dallas, Texas, has found a new use for one of its favorite processes—the edge lighting of acrylic sheet material.

The crucifix pictured on page 178 was among the first products of the manufacturer, certainly one of the company mainstays so far as steady popularity is concerned. Perhaps the foremost reason for the success of the crucifix is the fact that it takes advantage of the light-piping properties of the acrylic of which the cross, with molded-in figure, is made. The light source comes from a bulb located in the base of the crucifix. The reflections travel through the figure and highlight it in an attractive yet suitably dignified manner as befits the subject.

A crucifix does not offer a wealth of variation as to design. It must remain true to form, simple and authentic. Credit for varying this crucifix in a pleasing way and yet retaining the religious significance, is due the designer who conceived the idea.

A new product is born

When an advertising man came into the company's office seeking counter display pieces, firm members used their experience in edge lighting to design a faceted plaque carrying an advertising message which utilized the light-piping characteristics of acrylic as well as its clarity and brilliance.

Plastics Mfg. Co. went to work on the problem of molding-in the printing of the advertising message and developed mass production techniques for turning out the plaques quickly. Now counter copy for attracting the consumer can be produced in quantity and variety. As can be seen above, the variations of

For products that should be seen but not touched ...Kodapak

KODAPAK makes shopping a pleasure—for merchants.

That's because shapely display cases made of this tough, optically clear material show off your product's beauty to sparkling advantage ... make shopping selection easier and faster ... yet always protect the product from dust, dirt, and fingering.

Kodapak sheet is made in two forms:
Kodapak I, cellulose acetate, in gauges from No. 88 (0.00088″) to 20 thousandths (0.020″).
Kodapak II, cellulose acetate butyrate, in gauges from No. 90 (0.00090″) to No. 200 (0.00200″).

Current supplies of Kodapak are somewhat limited, due to continually increasing demand. But the Kodapak Demonstration Laboratory in Rochester is available to demonstrate fabrication possibilities and practical end uses.

For the display you *want*
...the protection you *need*...

Kodapak

T. M. Kodapak Reg. U. S. Pat. Off.

Cellulose Products Division
Eastman Kodak Company
Rochester 4, N. Y.

Kodak

NOW

These molding powders are available to you immediately:

Cellulose acetate
Cellulose acetate butyrate
Ethyl Cellulose
Polystyrene

Colored or transparent • Granules or pellets

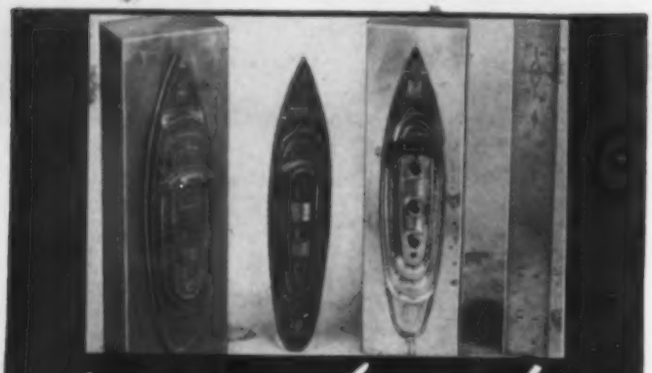
FOR

Injection molding
Extrusion

FROM

FRANKLIN JEFFREY CORPORATION

1671 McDonald Ave. Brooklyn 30, N. Y.
ESplanade 5-7995



promise keeper!

NOCO TRADE MARK HOBBED CAVITIES

If your problems involve large scale production with delivery dates to meet—you'll find Hobbed Cavities a great help in keeping promises. We'll be glad to show you why *Newark* Hobbed Cavities are the choice of so many plastic molders.

For further information, please write for our brochure "The Procedure of Die Hobbing".

NEWARK DIE COMPANY, Inc.
20-24 SCOTT ST. NEWARK, N. J.
Telephone: Market 2-3772, 2-3773

Lit from below, an acrylic crucifix, mounted on phenolic, is effective. Same technique is adaptable to other fields

scroll and lettering are unlimited, even by the most intricate patterns.

Introducing color

The element of color, always important in advertising, is supplied the piece by placing a secondary plaque, of any desired color, in back of the clear plaque. The latter is heat-welded to the clear front.

When a second color is desired, as is usually the case, it is easily acquired by filling in the backs of the molded letters with reflective resinoid—any colors in the middle range to black can be used—the highly reflective ones having been found by experience to be the most satisfactory.

Similar base used

The bases for the crucifix and advertising plaques remain similar. Both are phenolic, molded in a simple shape. Into them are put 7-watt Christmas tree bulbs, that furnish the light, and the plastic socket. Wire connections are covered with phenolic insulator caps. Sealed across the bottom, a closure of phenolic and paper laminate adds all the extra insulation that is required for complete safety.

Now that the problem of mass production on these signs has been solved they will probably have increased use. Their performance as displays has pleased because they are easily cleaned, indestructible with ordinary use and retain their color.

MAXIMUM LUBRICATION... MINIMUM "STICKING" with Metasap Mold Lubricants

PHOTO COURTESY OF BOONTON MOLDING CO.

Metasap Stearates in your compound will keep plastics flowing without the need of excessive heat . . . prevent sticking to the molds . . . cut down heating time and costs.

Other Advantages of METASAP STEARATES

You'll also get these advantages from Metasap's better lubricating properties. Metasap Stearates permit operations at lower pressure. They penetrate to the surface of the compound to give a clean-cut finish. They help to lengthen die life and eliminate the need for buffing operations. If desired, Metasap Stearates may also be "dusted" on the molds.

The value of Metasap's improved internal lubrication—as an aid to better and more economical molding—is particularly revealed in plants requiring intricate mold designs and precise fabrication.

For complete information, write:

METASAP CHEMICAL COMPANY, HARRISON, N. J.

CHICAGO • BOSTON • RICHMOND, CALIF. • CEDARTOWN, GA.

METASAP CHEMICAL COMPANY

REG. U.S. PAT. OFF.

Stearates

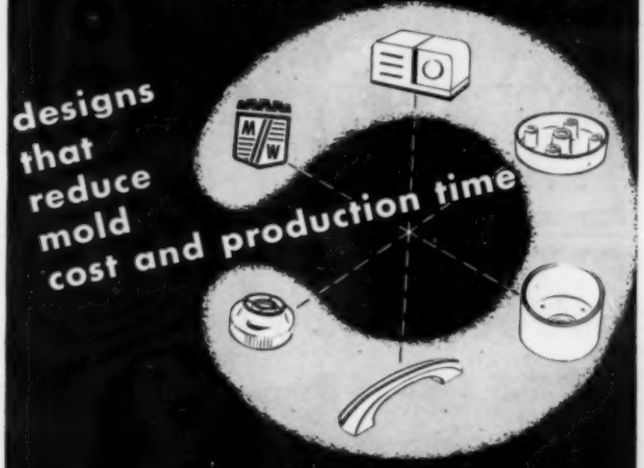
of Aluminum · Calcium · Lead · Zinc

Industrial Plastics Co.

A Division of INDUSTRIAL ABRASIVES INC.

Announces

A NEW ENGINEERING SERVICE DESIGNED TO SAVE YOU MONEY AND TROUBLE . . .



the Industrial Plastics Co. is geared to save you time and money through better engineering and modern methods. We approach each design with a thorough knowledge of the problem. You get *extra* attention and *extra* service! From the first time we see your product to the last detail in the design of its plastic parts, every step is carefully mapped out and controlled in our efficient factory. Call us in . . . compare our methods with your present methods. Compare cost, too!

INDUSTRIAL PLASTICS CO. *serves the Greatest Names in Industry!*

GENERAL MOTORS BENDIX STUDEBAKER CORP.
BELMONT RADIO DORMEYER CORP. NOBLITT-SPARKS

and many others

INDUSTRIAL PLASTICS CO.

3724 West 38th Street • Chicago 32, Illinois

WIRE . PHONE . WRITE . . . for conference

PLASTIC MOLDS

30 years experience in designing and building molds for leading molders.

Our plant is modern in equipment for producing the best in molds.

Compression • Injection • Transfer

New equipped with an eight-ounce injection machine for testing molds!

SOCIETY OF THE PLASTICS INDUSTRY · SPI

FORTNEY MFG. CO.
INCORPORATED
247 N. J. R. R. Ave. Newark 5, N. J.

Do *YOU* have a *PRESSING PROBLEM?*

A little ingenuity and a Hein-Werner Hydraulic Jack can provide the answer to many pressing problems in laboratories and plants manufacturing plastic products. We supply the unit and you incorporate its use in a press of your own construction.

Whatever your pressing requirements, the powerful, easy-operating efficiency of Hein-Werner Hydraulic Jacks can provide the capacity to handle the job. Made in Models of 1½, 3, 5, 8, 12, 20, 30, 50 and 100 tons capacity. See your nearest industrial supply distributor, or write us for details.

HEIN-WERNER CORPORATION
WAUKESHA • WISCONSIN

Vinyl sheet toys

AN INFLATED vinyl Santa Claus will be on hand this Christmas, and in his bag there may well be scotty dogs, boggle-eyed fish, clowns, balls and a menagerie of assorted animals, all of vinyl.

Easily cleaned and proof against oil and grease as well as water, vinyl is held to be an ideal material for such toys. Particularly suited to the application is the material's sealing abilities. Since these are color-fast too, they will be marketed as bath toys.

Vinylite is used by the W. S. Rainford Products Co., Inc., Closter, N. J., for its line of Christmas favorites in plastic dress. In its merchandising this fall the company will stress the toys' safety factors, their durability

PHOTO, COURTESY W. S. RAINFORD PRODUCTS CO., INC.

Above are a variety of inflated vinyl toys. They are gayly colored, soft when blown up, yet strong and durable

A sure hit are these attractive vinyl fish which are produced in England. They too come in many colors

PHOTO, COURTESY PLYSU PRODUCTS, LTD.

PHOTO, COURTESY VANGUARD CORP.

This scottie is available in red, blue and yellow. A new type valve is safeguard against cuts and scratches

and the small amount of space they take when stored. When inflated the figures will be resilient, soft and easily cleaned with a damp cloth. Borderless seams will hold the toys together. These provide no opportunity for dirt to collect. Nor do they come open easily.

No paint is used. The gay colors are in the material itself. A tinted Vinylite solution is welded to the sheeting, incorporating the color permanently into the toy. If paint were used, frequent inflation and deflation would cause it to crack and in short order, flake off.

British fish

More spectacular, perhaps, than the Santa Claus and the clowns are the British-made vinyl fish. Plysu Products, Ltd., manufacture these over-sized and multicolored fish by a high-frequency welding process. By this method the toys are welded on all seams simultaneously in one short and simple operation. It is faster than sewing.

The British fish are made of vinyl sheet, produced by Olympic Industries, Ltd., from compounds supplied by Bakelite, Ltd.

Bright scotties

While giant fish come out of England, a line of scotty dogs in red, yellow and blue is issuing from the Vanguard Corp. of Springfield, Mass. The eye-catching colors of these dogs will not be their only sales-appeal. The merchandising will also call attention to a new type of valve employed on the toy dog. The valve for inflating the toy cannot scratch or cut, it is claimed.

When fully blown, the scotty dogs measure approximately 10 in. by 12 in., a convenient size for play in bathtub or on beach.

Though other toys are not yet announced by Vanguard, the company has revealed that this scotty dog is but the first model in a long line.

Other vinyl toys will probably be on the counters long before Christmas. Those listed here serve only to spot a trend.

DESIGN *plus*

We GIVE YOU THE *PLUS*, TOO!

Besides superlative designing, our staff of skilled plastics molding technicians gives you the *plus* which is so extremely important to the finished product.

At the top of the *plus* list you will find *Mold Building* — an art at which our technicians are especially adept.

Styling, Model Making, Facilities Layout, Operations Controls, Heatronics, Molding and Finishing Problems are also included in the *plus* our service brings to you.

Let us show you. Phone or write us.

AMERICAN PLASTICS ENGINEERING CORP.
3020 E. Grand Blvd., Detroit-2, Mich.
Madison 7235

AMERICAN PLASTICS ENGINEERING

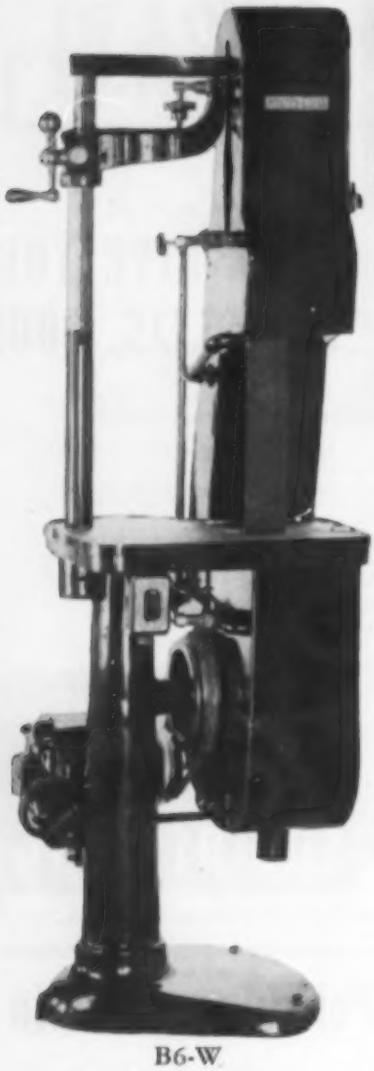
New Mold Polishing Bulletin

Send Now... FOR YOUR FREE COPY

Gives details on Acme's New Plastic Mold Polishing Service. Produces mirror-finished mold surfaces. Results in more perfectly finished plastic parts. Service is fast, economical. Saves you time, trouble and money. Write . . .

ACME SCIENTIFIC COMPANY
1451 West Randolph Street • Chicago 7, Illinois

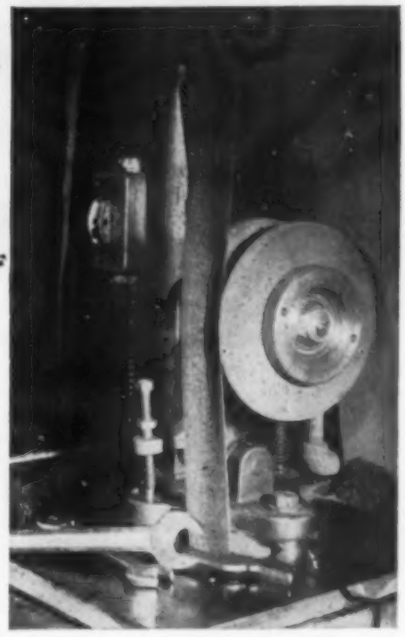
FLEXIBLE WET BELT . . .
Makes Clean-up Faster & Cleaner



B6-W

Porter-Cable Abrasive BELT SURFACERS

Quickly adaptable to different shapes
Grinds contours and curved surfaces



Close-up of B6-W at work

As the cost of labor and materials steadily increases, it's a tough job to keep your product within competitive range. But you can do it.

Begin by tackling expensive clean-up operations...with Porter-Cable Belt Surfacers *(*either wet or dry belt*)*. You'll marvel at the time savings over hand or "gadget" methods.

Porter-Cable Belt Surfacers are proved plastic shop equipment. They remove gates... parting lines...flashings. Finish rough spots...smooth out molded effects and deep surface scratches. Operate equally well on thermoplastics or thermosetting plastics.

Notice in illustration above how the flexible belt follows the contour of ordinary metal pulley used as platen—an attachment that makes finishing of irregular shapes easy.

WG-4

GET FEWER REJECTS

In addition to doing better work *the first time,* Porter-Cable reduces flow, discoloration, burning and abrasive loading—and does not leave tool marks.

The WG-4 does flat grinding on platen and line-contact grinding on resilient contact roll. Has self-contained coolant system and re-circulating tank. Drawer traps grinding waste. Tilted head for free use of contact roll and full use of coolant on belt.

FREE SERVICES . . .

Let us prove that Wet Belt Machining can reduce the cost of many of your operations. Send us samples for recommendations...or ask to have our engineers discuss your problems at your convenience...at your own plant. Also, send for film on Wet Belt Machining Methods—"Machine of the Age"—loaned *free.*

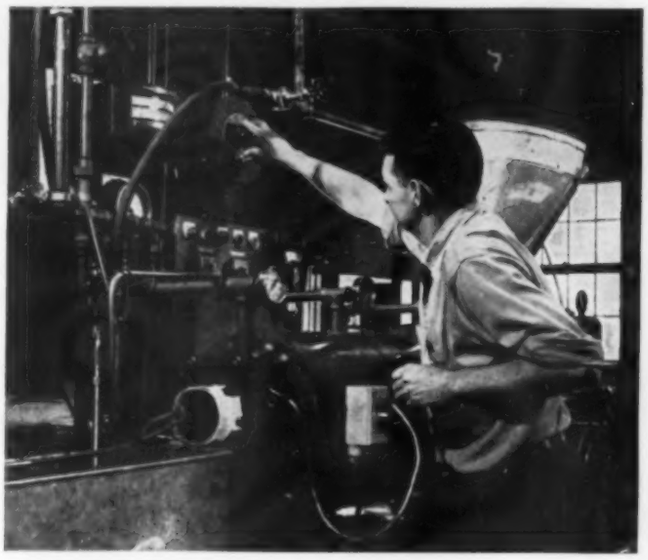
PORTER-CABLE
MACHINE COMPANY
1606-10 N. SALINA ST. SYRACUSE 8, N. Y.

AUBURN Plastics Reporter

Auburn Button Works, Auburn, N. Y.

MOLD MARK

Auburn Extrudes Wide Variety of Products



Operator shown at extruding press.

With four extruders, Auburn Button Works is able to handle a wide variety of customer requirements for extruded articles. Using these machines, Auburn can extrude rods from very small diameters up to one inch, tubes up to 2¾ inches and flat shapes ⅛ by 2 inches,

Die design is the determining factor in successful extruding. Auburn Button has had many years of experience in designing and making dies, all of which are made in Auburn's own tool shop.

Operation of an extruder looks fairly simple. Material, such as one of the vinyls, with or without plasticizer or filler, is fed into the hopper where it comes into contact with a heated screw. Heated into a softened mass, the screw forces the material through the orifice of the die, which is designed to meet customer specifications. Emerging from the die, the extruded product passes through a tank of water or to a 40-foot conveyor belt on which it cools. It is cut into desired lengths or wound on reels.

A wide variety of products have been extruded by Auburn. Among them is a typewriter type bar cushion. The vinyl used lasts longer and is not susceptible to wear. Another new application extruded by Auburn is tennis racket grip. Other products: three-hole tubing for insulating hearing aid wiring, belts, football helmet edgings, seat covering welting, spark plug washers, liquid transmission piping, handbag straps and wiring insulation of all types.

Auburn Button is now in a position to accept new customers for extruded products. Inquiries will be promptly acknowledged and will be held in strictest confidence.

Sales Manager

William A. Freyer

He recently celebrated his 25th anniversary with Auburn Button Works.

Profitable Tips To Purchasing Agents

Here's a simple little trick that will save you money: It has to do with gate scars. We just can't do anything about them. Injection molding hasn't reached the degree of perfection where they can be eliminated (although we're working on that, too!). They must still be buffed off by expensive hand labor. That raises our costs . . . and our prices.

But these buffing costs can be eliminated if parts are designed so that gate scars are covered up by components or inserts. In many cases this can easily be done. We'll be glad to try if you submit your complete design before quotation.

'Plastics Makes Perfect'

Kiddiescope Film Viewer
By Noma Electric Co.

Lesson:
Strength and opacity are always symbolic
When housing is made of good black phenolic.

Auburn Button Works Installs New High Speed Press

In accordance with its policy of employing the most modern equipment to produce better products at lower cost, Auburn Button Works has just installed the latest in high-speed plunger molding equipment. Made by Lake Erie Engineering Company, Buffalo, N.Y., the 200-ton press is push-button controlled. Instead of utilizing the conventional top ram for molding thermo-setting materials, a ram within a ram is used for this advanced method. As soon as the clamping pressure is applied, the inner ram or plunger forces the high frequency-heated preform through short runners of very small cross sections into closed cavities.

This technique is particularly adapted for parts having heavy cross sectional areas such as handles, as rapid cycles are possible by the combination of hot preforms and frictional heat generated in the transfer through the small gate connecting "pot" with cavity. Delicate inserts and core pins hold up in this method, and finishing is reduced to a minimum because the material, in highly plasticized condition, is forced into a closed mold. Hence no flash—and only the gate scar need be removed.

Lowest Cost

3/4 OZ. INJECTION MOLDER

New MOSLO MINIJECTOR has 4 other features:

1. Interchangeable injection units.
2. Molds *all* thermoplastics.
3. Quick-changing dies.
4. Utmost ease of operation.

Write today for complete details and prices.

MOSLO MACHINERY CO. CLEVELAND, OHIO

DETECTO SCALES

There's a precision-accurate Detecto Scale for your specific weighing and counting need. The Detecto helps increase production, yet assures you maximum accuracy by making slightest weight discrepancies immediately visible.

No. 1800 DETECTO-GRAM INDICATOR HEAD

One more Detecto weighing instrument to speed production. This attachment converts your present beam scales to accurate weighing equipment. Indicator stops instantly at correct weight.

Write for circular.

DETECTO · SCALES · INC.

MAKERS OF FINE SCALES SINCE 1900

1310 MAIN STREET · BROOKLYN 1, N. Y.

SCALE ENGINEERS IN ALL PRINCIPAL CITIES

Irregular surfaces can be marked economically and intricate designs are no problem with new marking method

Color marking process

A NEW METHOD of putting individualized multi-colored decorations on stock mold items has been developed by Modern Art Printing Co., 21 W. 17th St., New York City, which is said to offer molders a number of advantages:

1. Irregular surfaces can be decorated as easily as plane ones.
2. Markings can be debossed and inked in a single operation.
3. No provision for lettering or decoration has to be made when the item is molded.
4. Economy of operation.

The process is a modification of hot stamping and uses special inks in addition to the usual color foil. Either thermoplastic or thermosetting materials can be marked on plane, concave, convex or irregular surfaces.

Intricate designs no problem

It is said that intricate detail, such as appears on trademarks, can be reproduced at no greater cost than simple designs of the same size and color. Three colors can be applied in one operation, thus making it possible to reproduce multi-colored designs as economically as a single-color marking. Typical of the effects that can be achieved by this process are the plastic articles shown in the accompanying illustration.

To molders of premium items, the new process will be particularly attractive because it will enable them to eliminate molded-in lettering and use the same stock mold for different customers, thereby greatly lowering unit costs.

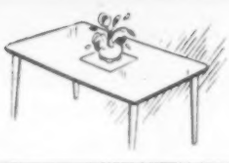
SAVE THE WASTE OF WEIGHT...

When a surface material is required for tabletops, wall surfaces, furniture surfaces, you can cut your costs without any sacrifice in quality or appearance by using Plyon. For Plyon is the versatile thermosetting laminate that is available in thicknesses of 1/16" or 1/32".

A thin material makes no sacrifice in the quality of the surface and Plyon makes it possible to achieve all the effects of unusual patterns, color combinations, wood grain effects, etc.

Plyon does not chip, peel, or lose its brilliant lustrous appearance. It resists alcohol, soaps and mild abrasives.

Investigate the savings of what can be enjoyed with Plyon—the thinner surface material.



Tabletops can be produced at a lower cost without sacrificing quality or appearance. Tops are washable, waterproof, resist most acids and solvents.

Wall surfaces, display panels, folding screens, moldings and luggage can all utilize the strength, surface hardness and low cost of Plyon.

Desk tops that retain the attractiveness of wood grains and eliminate the need for auxiliary surface material are available with Plyon. Pastel shades, fabric patterns, solid colors, etc., can be had with Plyon.

Swedlow PLASTICS CO.

5527-33 District Blvd. • Los Angeles 22, Calif.

West Coast Distributors:
FIR-TEX OF SOUTHERN CALIFORNIA. 812 EAST 59th STREET, LOS ANGELES, CALIFORNIA Telephone: ADams 8101

PHENOPREG
LAMINATING MATERIALS
FOR ALL TYPES OF LAMINATES AND MOLDED LAMINATES

If you are considering the production of decorative laminates for counter top application—specialized laminates for industrial applications—or molded laminates for applications requiring high impact value, we have a Phenopreg grade that will meet your requirements.

Phenopreg (phenolic resin impregnated) and Phenopreg MB (melamine resin impregnated) materials can be laminated by the application of heat and pressure (either high or low).

We invite your inquiries on your problems involving laminating materials.

FABRICON PRODUCTS, INC.
PLASTICS DIVISION
1721 Pleasant Avenue • River Rouge 18, Michigan
Vinewood 1-8200

REPRESENTATIVES
EASTERN CANADA—Plastics Supply Company—Offices in Toronto and Montreal.
WEST COAST—Zellerbach Paper Company—Divisions in the Principal Cities of the West.

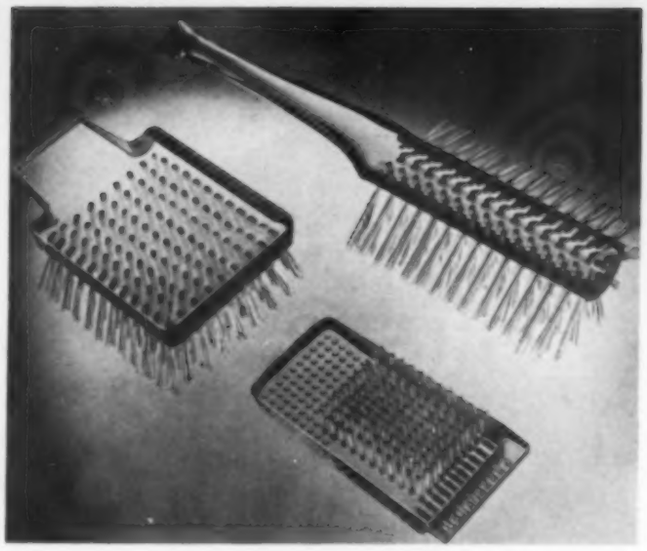
STAINLESS STEEL
"PERI-CASTING"

Save Time . . .
Peri-Cast components can be delivered in 28 days. They are easily worked for fit. Months of tooling are eliminated. You can get into production faster.

Saves Rejects . . .
We reproduce your model with hairline accuracy. Peri-Castings polish, mirror-like, to a finish as fine as chrome plating. This New pheripheral casting technique has no limitations on shape or intricacy. The hard finish compares to A.I.S.I. 420 Stainless Steel.

Save Costs . . .
Peri-Castings survive years of capacity production. Your original cost is low; forces and cavities are ready—no danger of last minute tooling damage; minimum time required for fitting.

Write for Complete Data
Elmer C. Maywald
& COMPANY Inc., 11 S. LaSalle St., Chicago 3, Illinois
Sub Agents for: Michigan, Indiana, Illinois, Wisconsin, Iowa



1—The quality that can be imparted to a product by the use of acrylic materials is evident in these three brushes

New acrylic brushes

PLASTICS HAVE risen to top popularity as a material for the manufacture of brushes for personal use. They are to be found not only in the handles and backs but in the bristles as well. If further reason for this popularity were necessary a quick glance at a few of the newer brush models just coming on the market might provide the answer.

Attractive designs possible

An example of the attractive designs possible with molded acrylic is the line of brushes manufactured by the Owens Brush Co., 901 Buckingham St., Toledo, Ohio (Fig. 1). Raymond Loewy Associates designed the new line which includes the Patrician hairbrush for women, the Club Militaire for men and a hand-and-nail brush.

A 6-cavity die is used to mold the handles from clear Lucite. The nylon bristles are stapled in place with non-rusting nickel silver wire.

Less weight with open backs

Open backs are a distinctive feature of the Lite-wave brushes manufactured by the Wecolite Co., 552 W. 53rd St., New York City (Fig. 2). The openings reduce the over-all weight of the brushes considerably, making them pleasanter for users to handle and cheaper to ship. The company's advertising stresses the openings in the plastic backs as an aid to cleanliness.

Nylon bristles are used in the hair and hand brushes, which are available with clear, pink or blue Lucite backs. The same brushes are also made with cellulose

AVAILABLE NOW

Embossed designs on Vinyl Film

By an exclusive process that we have developed, you can now get precise and beautiful designs on .004 to .025 gauge unsupported films or on all coated fabrics. Pyroxylin, vinyl, the organosols, as well as polyethylene and polythene from .0025 gauge up can be embossed in up to 54 inch embossing widths.

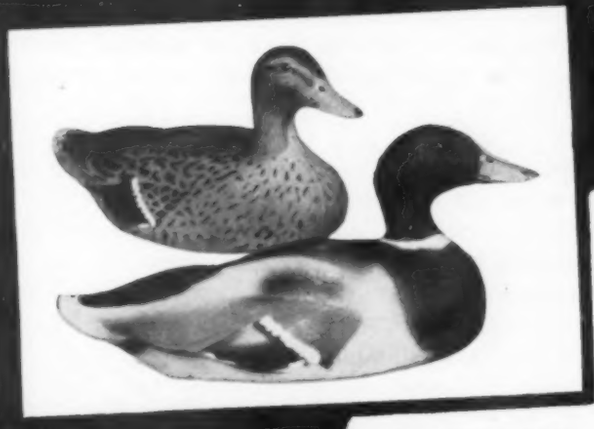
This unique process of *roller molding* embossing adds beauty and decorative appeal to plastic film or coated fabrics. Many standard designs are available for you to choose from.

We shall be glad to show you samples of embossing done on a wide range of materials. We shall also be glad to quote you on embossing one of our regular designs—calf, skiver, levant, colonial, or crepe pin seal—on your material—or in making up an entirely new design according to your ideas.

Write or phone—

J. J. Brown & Co., Inc.

2017 Lower Road Linden, N. J. Linden 2-7390



Produced in *PLASTIC*, by INJECTION MOLDING, of course!

Equipped to Solve Your Plastic Production Problems

The use of thermoplastics has proved the perfect solution to countless of today's knottiest production problems. Many products and parts can be made far more satisfactorily of plastic than of formerly-used materials.

Many nationally-prominent manufacturers and assemblers have found our highly trained creative staff of designers and engineers — specialists in thermoplastics — indispensable in analyzing and working out their problems.

Moreover more prompt shipments of finished plastic products are facilitated by our central location.

It costs you nothing to find out whether we can serve *you* better, too. Write or wire us.

CREATIVE DESIGNING ENGINEERING

IMCO

Speed—Precision Economy

COMPLETE TOOL and DIE PLANT

Capable of finest precision work of unlimited scope, our complete Tool and Die Plant, operated in conjunction with our thermoplastic processing plant, assures greater speed, precision, and economy.

INJECTION Molding COMPANY

3823 INDEPENDENCE AVENUE, KANSAS CITY 1, MISSOURI

IT CAN BE DONE

Don't let anybody tell you that it is impossible to reduce pressures as high as 6,000 lb. per sq. in. WITHOUT SHOCK. It CAN be done. How? Easily. Simply specify an

ATLAS Type "E"

High Pressure Reducing Valve

like the one shown at the right. This valve is now serving satisfactorily in all of the leading plastics plants, handling water, oil, or air.

Do You Guarantee It?

Yes, ATLAS guarantees *every* valve made in the ATLAS Plant, and we have made a great many during our nearly one-half century of making regulating valves for every service—*exclusively*. For instance the body of Type "E" is of forged steel. All internal metal parts are wholly of stainless steel. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure. Ask for complete information.

For other ATLAS plastics plant products see the partial list in our ad in the January 1947 issue of MODERN PLASTICS

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

277 South Street, Newark 5, N. J.

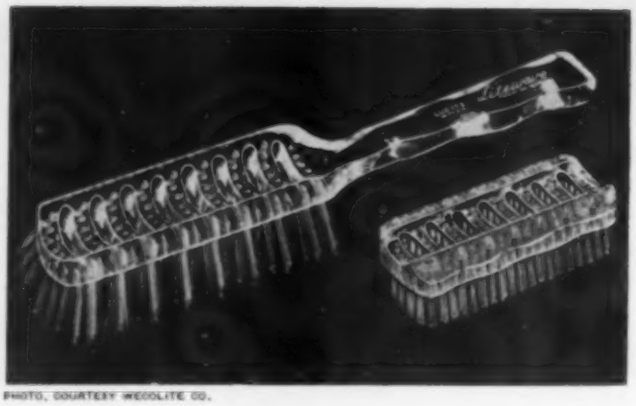
Represented in Principal Cities

Decorators on Glass and Plastic Containers Since 1936

4 Colors in One Operation —Finest Detail

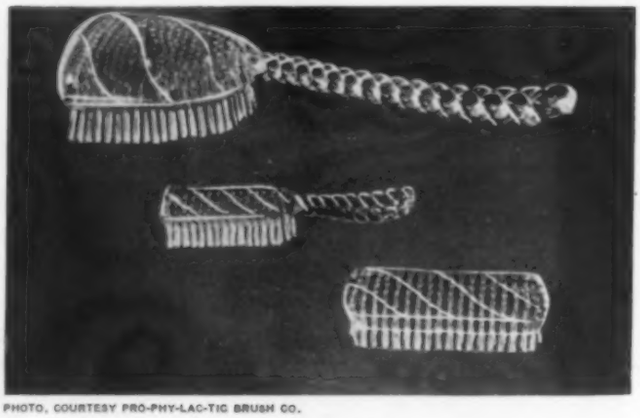
Anigraphic Process, Inc.

11 BROADWAY, NEW YORK 4, N.Y. · WHITEHALL 3 5253



PHOTO, COURTESY WECOLITE CO.

2—Both brushes are molded of acrylic as well as cellulose acetate. Nylon is also used for some hand brushes



PHOTO, COURTESY PRO-PHY-LAC-TIC BRUSH CO.

3—Full use is made of the light piping properties of acrylic in this brush set with its twisted design effect

acetate backs in various colors. Some of the hand brushes are available with nylon backs. This particular model will stand hospital sterilization and is designed for use by doctors and nurses.

The handle of the hairbrush, which is shaped to conform to the hand, is molded in a 2-cavity die, as is the back of the smaller hand brush.

Set of bath brushes

A 12-in. bath brush, a hand brush and a nail brush make up the Swirltwist bath ensemble, manufactured and molded by the Pro-phy-lac-tic Brush Co., 221 Pine St., Florence, Mass. (Fig. 3). The brushes, available separately as well as in sets, are a part of the Jewelite line and are available in either clear, ruby or sapphire Plexiglas.

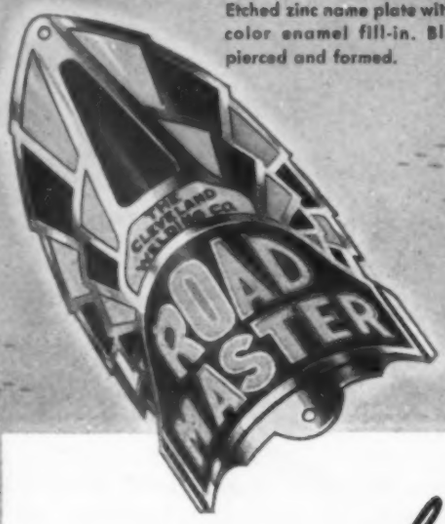
Peter Muller-Munk created the twisted effect design to add to the appearance of the brushes by catching and reflecting light from all angles. Prolon bristles are used throughout this entire line.

Fabricated military set

Simple, attractive design is a feature of a 5-piece set for men fabricated by the Shoreham Mfg. Co., Inc..

ORNAMENTATION OF METALS

Etched zinc name plate with three-color enamel fill-in. Blanked pierced and formed.



PLASTIC AND METAL COMBINATIONS

Highly decorated center button of clear plastic, set into plastic container with decorated chrome metal strips.

Under one big roof at AUTO-LITE

The versatility of plastics, metals and plastic-metal combinations has opened unlimited possibility for the modern designer who is striving for precision and eye-catching appeal at the least possible cost. Under one big roof at Auto-Lite's Bay Manufacturing Division are the technical skills and the equipment which provide decorative and functional developments in both plastics and metals . . . These have proved themselves essential ingredients in the development and improvement of a wide variety of manufactured products.

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Detroit 2, Michigan — Bay City, Michigan

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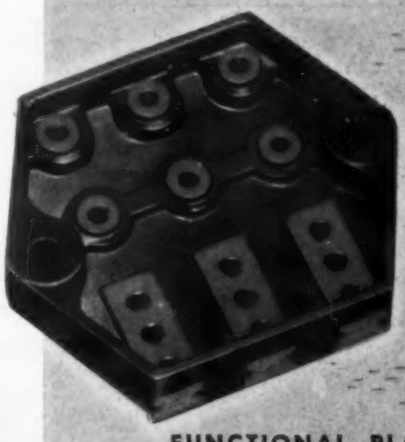
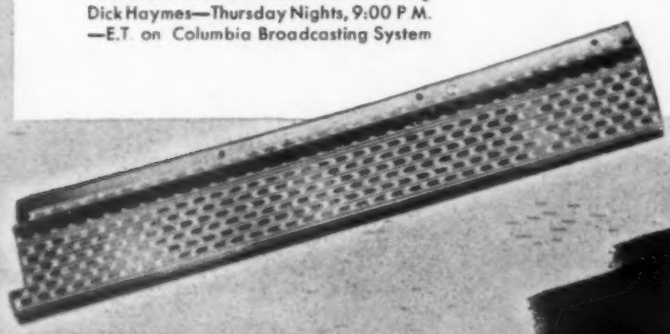
ORNAMENTAL PLASTICS

Clear plastic crest of three-dimensional casting, decorated enamel fill-in.



FUNCTIONAL PLASTICS

Plug-in thermo-setting plastic terminal with intricate metal inserts.



ROLLED AND FORMED METALS

Etched and polished aluminum scuff plate with enamel fill-in. Rolled, formed, pierced and trimmed.

Auto-Lite

SYREX PLASTICS

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CAST RESINS
RESINS for LAMINATIONS

CELLULOSE ACETATE
MOLDING POWDERS

ETHYL CELLULOSE
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POLYSTYRENE
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Canadian Manufactured Products

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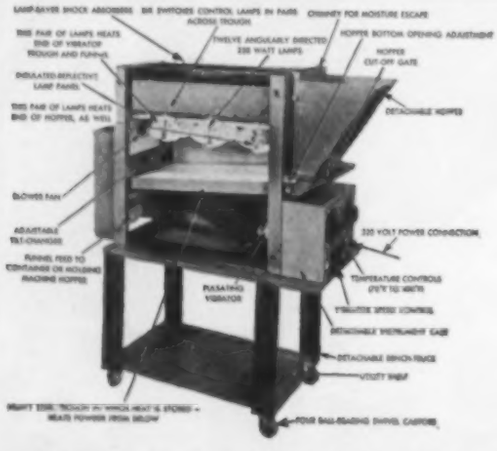
MISKELLA INFRA-RED
VIBRA-VEYOR WITH OR WITHOUT PORTA-VEYOR
SERVES THE PLASTIC INDUSTRY



The dream of delivering plastic powder exactly as it comes in the shipping drum without exposure or the need of human handling has at last been achieved. Now a full drum will feed for hours without further attention. Ask for new circular.

THE MISKELLA *Infra-Red* COMPANY
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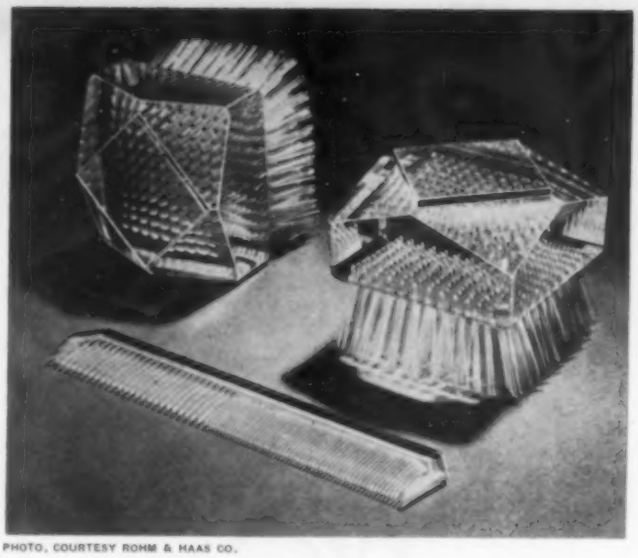


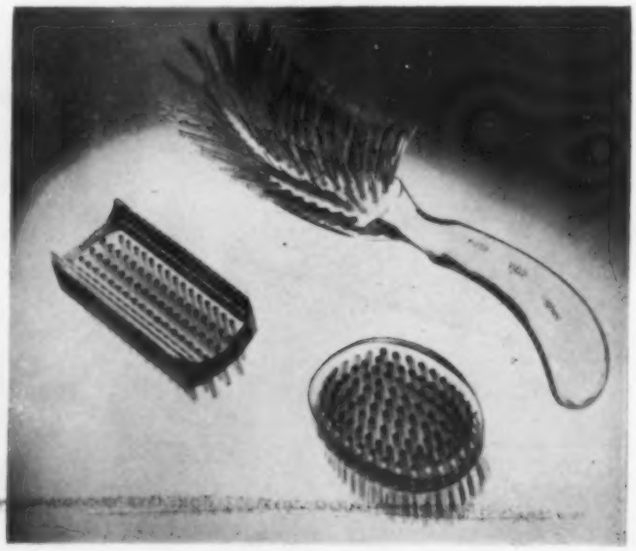
PHOTO, COURTESY ROHM & HAAS CO.

4—Quality appearance in these military brushes is due in part to the use of 2-in. thick acrylic in the backs

48-17 69th St., Woodside, N. Y. (Fig. 4). The set includes a comb, two military hair brushes, a clothes brush and a hat brush. All pieces except the comb are fabricated from 2-in. thick Plexiglas sheeting. Finished brushes are $1^{7}/_{8}$ in. thick at the center.

Sets for specific purposes also feature the line of Hughes Brushes, Inc., 500 Fifth Ave., New York City (Fig. 5). The Glamor-Groomer is a women's set which includes a comb, a hair brush, a complexion brush and a hand brush. Crystal, rose or blue Lucite is used for the solid parts and nylon of varying degrees of stiffness for the bristles of the different brushes. The crescent-shaped handle is designed to enable users to get a tight and comfortable grip on the brush.

5—The colors obtainable in acrylic add to the style and charm of this set. Nylon bristles vary in stiffness



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The EEMCO Laboratory Mill is entirely enclosed, ready to operate. It is equipped with built-in motor, control and variable speed drive. Mechanism readily accessible.

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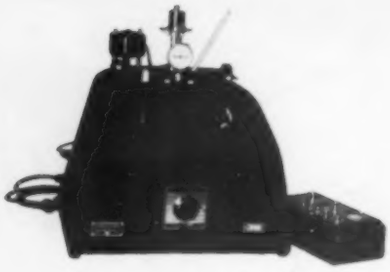
WEAROMETER: Designed to determine wear resistance and/or surface abrasion on many types of materials.

PLASTIVERSAL: For precision tests in tension and flexure, on film, sheet or molded specimens. Thick plates, blocks, etc., tested to heavy loads in flexure or compression. *The Universal Testing Machine for Plastics.*



DISTORTION TESTER: Widely used by producers of molded plastics and electric insulating materials for indicating heat distortion temperature.

IMPACT TESTER: Patented "Change-O-Matic" head, gives with a single hammer, quick reading Charpy and Izod tests.

OLSEN MACHINES *DESIGNED FOR* THE TESTING OF PLASTICS

Write for descriptive literature on all these machines designed specifically for the Plastics Industry

BRITTLENESS TESTER: Used for determining the temperature at which specimen will fracture.

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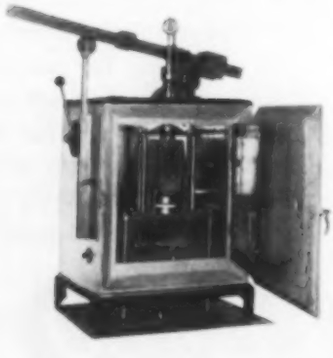
DILATOMETER: Apparatus for determining the linear coefficient of expansion



FLOW TESTERS: Both Olsen-Bakelite and Parallel Plate available. Curves can be conveniently charted on the flow characteristics of thermo-plastics and thermo-setting materials.

first to develop a corrugated box for *both* SHIPPING *and* DISPLAY

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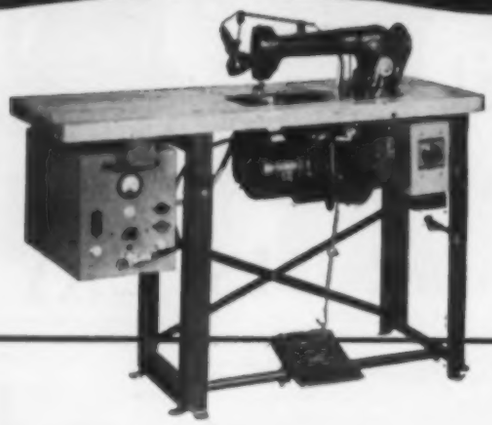
THE UNION SPECIAL
Electronic SEAMER



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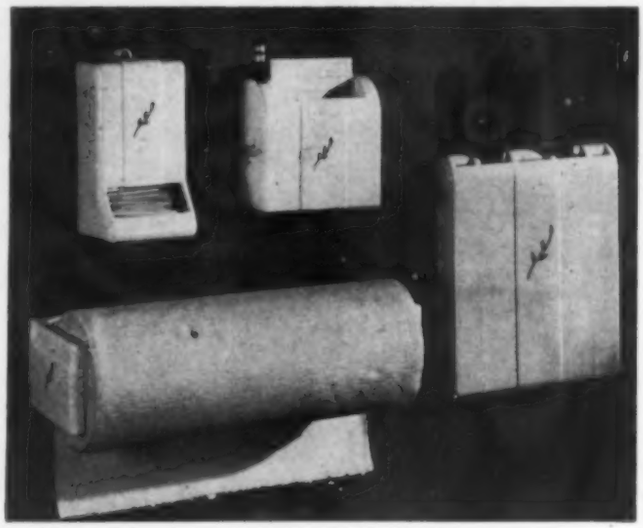
Molded kitchen ware



1—Matched set of polystyrene kitchen ware includes holders for knives, paper towels, matches, memo pad

EXHIBITING a widely varied assortment of styles and advantages, polystyrene is making its way into the kitchen.

A whole line of these accessories in uniform decorative dress is titled Ivy-Ware and offered by Fred H. Lewis Co. of Wilmette, Ill. Lustron is used in Ivy-Ware, and the set (Fig. 1) includes a closed knife holder, a box for memo pad and pencil, a match box holder of conventional design and a rack for paper towels.

Also completely enclosed is the Kitchen-Keen knife holder (Fig. 2) which uses a Bakelite polystyrene in a variety of bright colors. The holder also includes a nickel-plated sharpening device which automatically sharpens each blade whenever the knife is inserted.

Five knives may be accommodated in the Kitchen-Keen, and each may be up to 12 in. long and $1^1/_2$ in. wide. Kitchen-Keen is molded in one piece from a 1-cavity die by the Harben Plastics Co., 739 N. Spring St., Los Angeles.

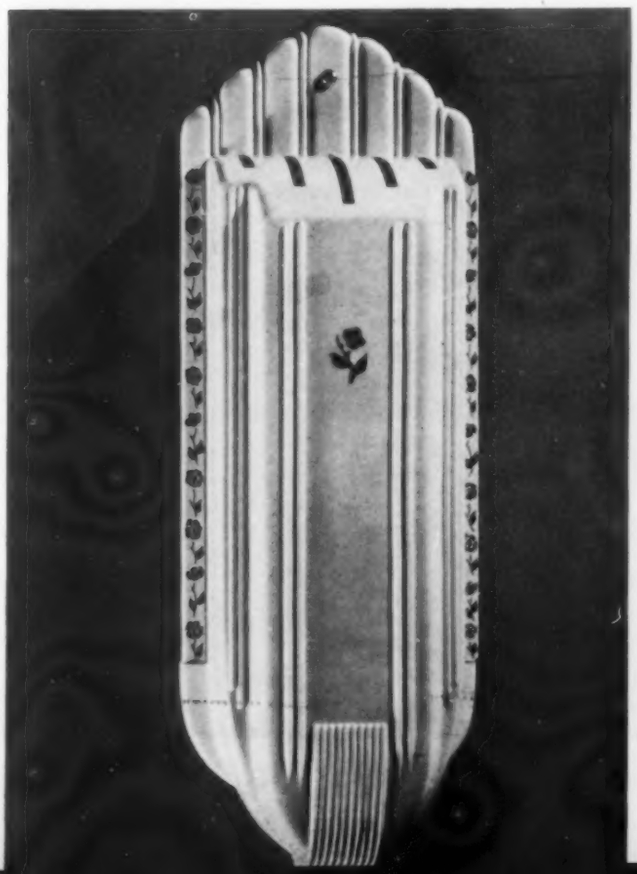
Another rack (Fig. 3) built to hold five knives, is made by the Bernard Edward Co., 705–07 W. Washington Blvd., Chicago, Ill., from Styron and Loalin. An insert in the lower part of this rack serves to keep the knives straight. A design is stamped on the front.

A smaller holder which does not fully enclose the blades is molded in one piece by the Precision Plastics Co., 4655 Stenton Ave., Philadelphia 44, Pa. The molding powder used is Styron and Lustron. Distributed by U. S. Plastics, Inc., 1512–14 Callowhill St., Philadelphia, Pa., the holders come in red, ivory and green.

Sun Plastics, 601 West 26 St., New York City, molds a knife holder in a 2-cavity die, cementing the back of it to the front. Here, too, polystyrene is used.

# of polystyrene

2—A nickel plated sharpening device is included in one polystyrene rack which holds five knives up to 12 in. long and 1½ in. wide. 3—Still another five-knife rack has decorative design stamped on front and insert in lower part of rack to keep knives straight



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This complete specialization covers every stage in the injection molding process from product engineering and mold design (two services which are also independently available) to making of the molds, molding and final finishing. The result is greater all-over economy, undivided responsibility for the job from start to finish and stepped-up production speeds. These gains are passed directly to you.

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ARPIN PRODUCTS
INCORPORATED
Moulders of Precision Plastics
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Locksley, famed archer of fiction, had to split his opponent's arrow in order to win the tournament. He did it, too! That was one time ACCURACY PAID OFF.

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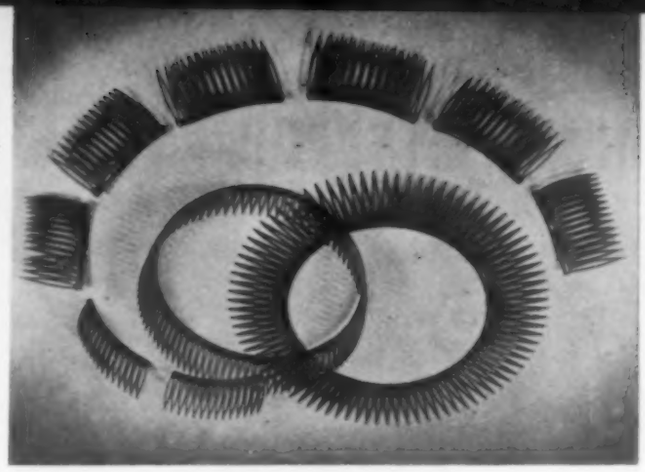

1—Combs in three stages are shown—in a flat circular form, as comb crown and as individual finished combs

New comb finisher

SECONDS count, and more and more plastic manufacturers are installing equipment to speed production. In line with this trend is a new custom-built comb crowning and cutting machine (Fig. 3) made by the C. Carlson Co., Boston, Mass., for a Massachusetts plastics comb manufacturer.

Crowning and cutting automatic

By the installation of two Bellows controlled air motors the die crowning and cutting process has been made automatic. Too, a higher and more uniform production rate has been attained through elimination of two foot press operations. With the old type machines, the crowning and cutting of a comb took two operators $1^3/_4$ minutes. The new machine does the job in just 12 sec. and it permits only one operator to handle the entire crowning and cutting process.

How the machine operates

The circular plastic combs that are finished on this machine are about 10 in. in diameter as they come from the molding machine. An operator trims the gates from the comb and places it on a heating platform. This platform, at the top of a sloping tray, is then brought to proper heat. After the comb form reaches the desired temperature it is tripped onto sloping tray.

The heating of the platform is controlled by a time relay; the tripping action is solenoid controlled. The comb slides down the tray toward the die, and, as it does, trips a micro-switch midway which causes one of the two air motors to move the tray out from underneath the tool.

This action of the retracting motor trips a second micro-switch, causing the second air motor to advance the tool into the 3-step telescoping die which crowns the circular comb form and cuts it into six finished combs. This tool is held in position by the action of a time delay device long enough for the combs to cool:

BUTADIENE for preparing new chemicals and polymers

(rubber-like materials, plastics, protective coatings, adhesives, reactive oils)

As marketed by Enjay, butadiene has a minimum purity of 98 percent by weight. In appearance it is clear and free of entrained matter.

PHYSICAL PROPERTIES*

Formula	CH_2: CH CH: CH_2	Melting Point, deg. C.	−113
State, at room temperature	Gas	Boiling Point, deg. C.	−3
Molecular Weight	54.09	Solubility in Water	Insoluble
Density, grams per milliliter	$0.650\frac{-6}{4}$	Alcohol	Very Soluble
		Ether, etc.	Infinitely soluble

* *Handbook of Chemistry and Physics, 28th edition, 1944*

For further information, contact

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FUSEprint by *Velveray* — the quality process that was specifically engineered for plastic film — either calendered or cast. FUSEprinting assures permanent adhesion . . . for the design is welded to the film itself.

If you have a visual problem, bring it to us . . . our wide technical experience is at your disposal — without obligation.

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You get quick delivery of finished molds from LENCO because our machine shop facilities are geared to a carefully devised work schedule. Moreover, design modifications recommended by our experienced engineering staff may result in simplified, lower-cost mold construction as well as improved molding performance.

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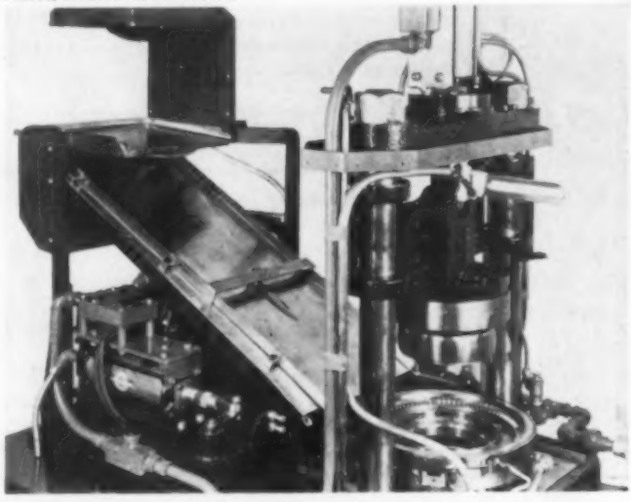
the action of the time delay and retraction of the air motor trips a blow valve that forces the six combs into the center of the die from which they fall into a bin.

The retracting of air motor also trips a micro-switch that de-energizes a solenoid on first air motor, causing it to advance the sloping tray into position for receiving the next circular comb form. The entire action of this unit is synchronized to operate at the same speed as that of the molding machine.

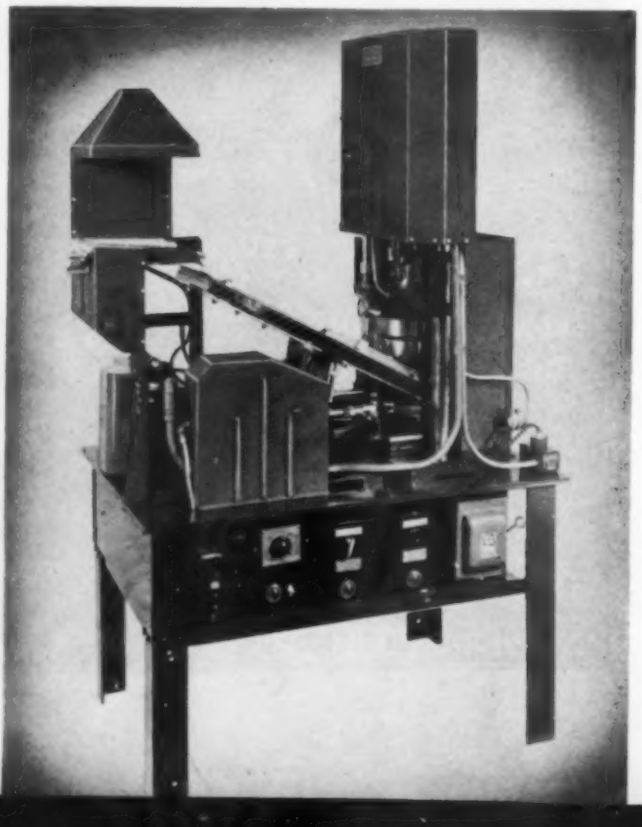
Equipment required to build this machine included the two air motors, one lubro-control unit, two types of relays, three micro-switches, two $^1/_4$-in. blow valves, and necessary hose and fittings.

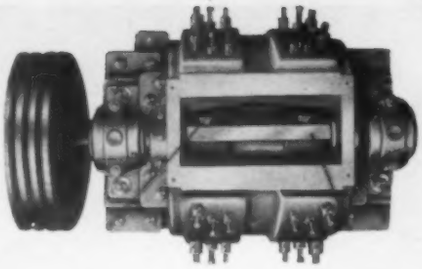
PHOTOS, COURTESY C. CARLSON CO.



2—Flat forms slide down tray into 3-step telescoping die which crowns form, cuts into six combs

3—Over-all view of new comb crowning and cutting machine that does its job in just 12 seconds





CUTTING CHAMBER

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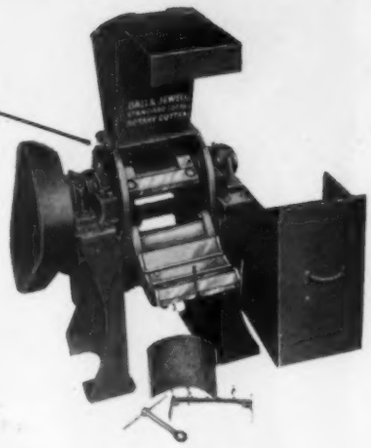
PLASTICS GRINDER
OUTSTANDING FEATURES



Consists of rotor with revolving tool-steel knives which cut against fixed stationary knives set on slight angle in cheek pieces, assuring shearing and cleaner cutting action. All parts and surfaces are machined and polished to assure smooth contact surfaces and easy cleaning. B & J Rotary Cutters are made in a wide range of sizes and types to meet any grinding requirement.

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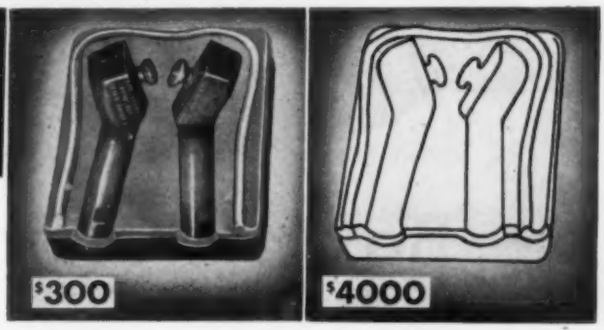
2. Low unit cost for short runs. Where volume production is not involved, there's *never* any need for using costly steel molds.

3. You save time. In many instances, first deliveries of finished parts can begin *in one week* from time order is received!

4. ***REZOLIN*** molds serve as excellent duplicating patterns from which steel dies are tooled. Their smooth hard surface doesn't chip or groove, permits 40% faster tooling of compound contours.



REZOLIN mold for miner's lamp housing (female half shown) was made in 2 days, cost only $300. 2,000 order short run was cast direct from this mold.

Here's part of the steel mold that *didn't* have to be made. Best estimates indicate a cost of $4,000. Tooling time: 4 months.

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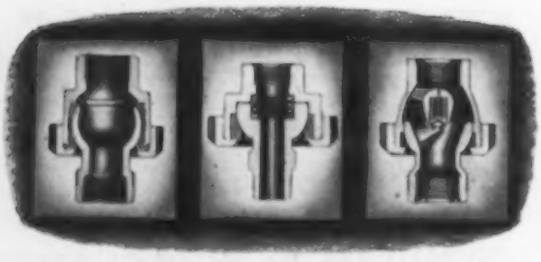

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Fashionwise glasses

WITH THE advent of improved techniques of laminating fabric between two sheets of acrylic, eyeglass frames have taken a further step in becoming fashion accessories as well as aids to sight. Possession of several interesting pairs of glasses is now, fashionwise, a must.

Gay patterned fabrics, twinkling sequins, glittering gold fringe show plainly through the clear plastic frames and are enhanced by its sparkle. Other styles come in white acrylic with hand-fabricated zebra stripes or checks in black.

Three companies have recently launched such ornamental frames, permitting glasses to harmonize with any feminine costume—evening, street or sport.

The frames shown in Fig. 3 are fabricated by Lu-Optic Mfg. Co., 301 Adam St., Brooklyn, N. Y. The laminating is done for this firm by the Plastics Div., Ranger-Tennere, Inc., 318 E. 32nd St., New York City. Any fast-color cloth is dipped into a special formulation and then air dried for 48 hours. The sheet is next placed between two thicknesses of Lucite or Plexiglas and is subjected to both heat and pressure in a laminating press.

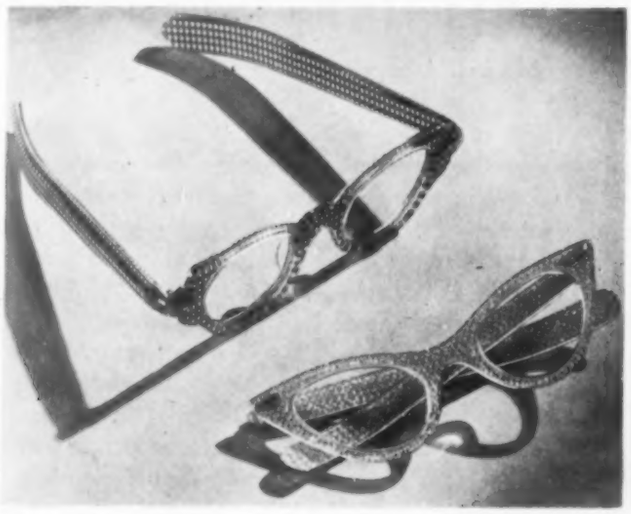
The sheets go next to the fabricator where the frames are hand cut from the sheets, hand styled and polished. The lamination of the acrylic with fabric has been found to increase the strength and durability of the material and optical frames.

Spectacles for formal evening wear (Fig. 1) take on glamour with black lace encased in transparent Lucite frames by a second laminating process developed by Charles Foster & Co., 550 Fifth Ave., New York City. This company experimented several years before per-

1—The clarity of acrylic enhances black lace in these eyeglasses which are designed for formal evening wear

PHOTOS 1 AND 2, COURTESY E. I. DU PONT DE NEMOURS & CO., INC.

2—Here, an attractive beach ensemble is created by using red and white sunglasses with matching sweater



3—Acrylic frames can also use check, gold-fleck designs

fecting its process and now makes frames in a wide variety of eye and bridge sizes. It has developed special techniques to get the most benefit from using acrylic and plays up the material's clarity, flexibility and color range.

Fixtures and jigs took over a year to build so that extremely close tolerances could be possible. All finishing of its frames is by hand.

Still a third laminating process has been announced by Thompson-Freeman, Inc., 29 Jumel Place, New York City, which supplies sheet material to Path-A-Lite Co., also of 29 Jumel Place. Path-A-Lite uses the material to make all types of frames. Figure 2 shows a pair of the company's red and white sunglasses—ideal for beach wear.

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SQUARING SHEARS ● ARBOR PRESSES ● FOOT PRESSES

PHOTOS, COURTESY E. I. DU PONT DE NEMOURS & CO., INC.

This spray of flexible polyethylene tubing may be attached to wall or held in hand for shower or shampoo

Portable sprays

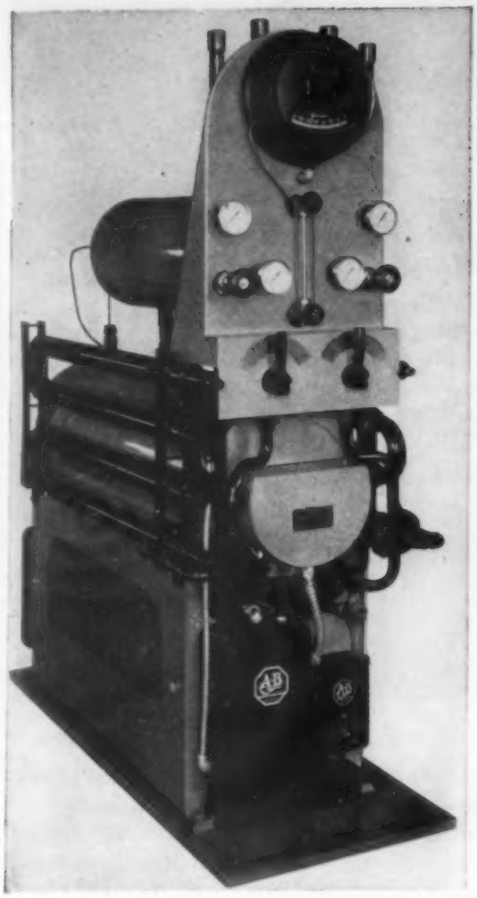
OWNERS of homes without built-in showers need no longer go without their daily showers thanks to portable sprays manufactured by Shore Line Industries, Clinton, Conn.

The Spraflex portable sprays are made from pearl-white flexible Polythene. This plastic material was chosen because it is unaffected by hot or cold water, resists cracking and does not stiffen with age. Tiny holes stamped in tubing provide outlets for water.

The larger spray (below) can be curved, then attached to tub with suction cups. When it is used this way, no shower curtain is necessary because the water is directed downward into the tub. The spray can also be attached to a wall to serve as a horizontal jet-type shower.

Another model (above) is small enough to hold in the hand and can be used for shampoos above a sink or tub.

Unaffected by hot or cold water, unlikely to crack or stiffen, polyethylene spray is easily attached to the tub



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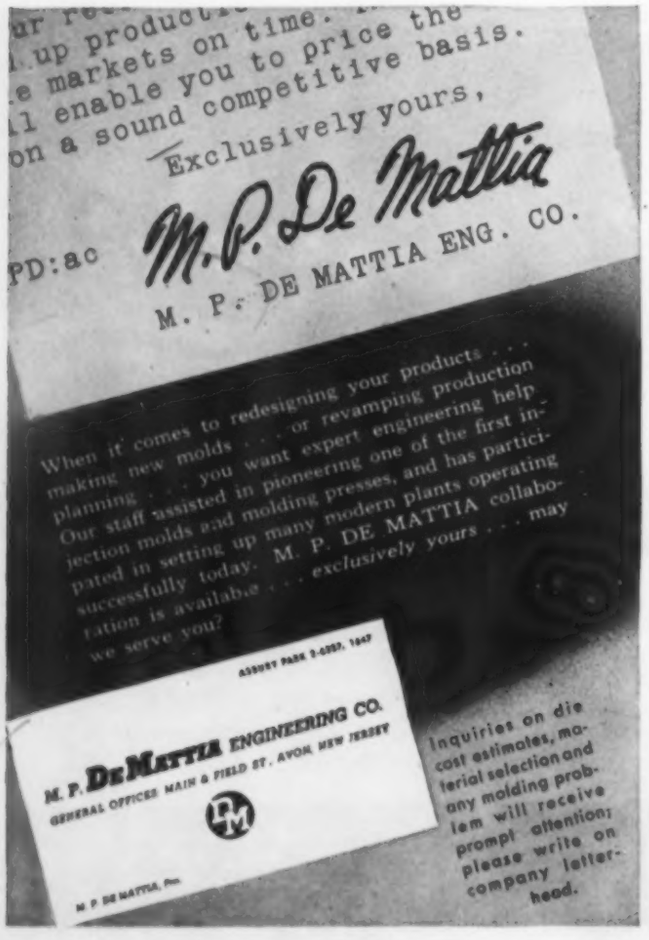
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PHOTOS, COURTESY DE LA RUE INSULATION, LTD.

This compartment has light fittings of acrylic, urea-formaldehyde laminate panels, phenolic laminate trim

Plastics in railways

Urea-formaldehyde, phenolic laminates are among plastics used in British coach

THE APPLICATION of plastics to public transport has taken a step forward in England with the announcement that the Great Western Railway will shortly put into commission a third-class passenger coach entirely lined and panelled with thermosetting laminated materials.

Last year, the Southern Railway added a Pullman cocktail lounge to the "Golden Arrow" continental express,[1] but this Great Western coach is the first passenger coach to be decorated with plastic materials.

Urea-formaldehyde linings

The principal material used for the wall and roof linings is a paper-based urea-formaldehyde laminate made by De La Rue Insulation, Ltd., and marketed under the trade name Traffolyte. Two colors have been used—a light turquoise blue and a broken grey onyx. The wall panels are $^1/_{16}$-in. Traffolyte bonded with a casein glue to $^3/_{16}$-in. thick hardboard.

The skirtings, door and window trim are machined

1 "Renovating rail cars with plastics," MODERN PLASTICS 23, 100, 101 (June 1946).

from the same company's paper-based black phenolic laminate called Delaron. All window sills throughout the coach are made from cigarette-burn-proof Traffolyte and Delaron laminates.

Care has been taken to leave as little chance as possible for train thieves to remove or dismantle panels or fittings. Screws in all the Delaron skirtings have been countersunk and the holes filled with glued Delaron plugs. All panel screws have been hidden by cover fillets of glued laminated strips.

A blue urea-formaldehyde laminate fascia or band conceals the front edge of the standard luggage rack fittings. The same material in $^1/_{16}$-in. thickness is used to form the curve backs of the recesses for the communication cords. It is bent to the required radius at a temperature of 150° C. These curved panels are held in position under their own tension.

Light fittings use acrylic

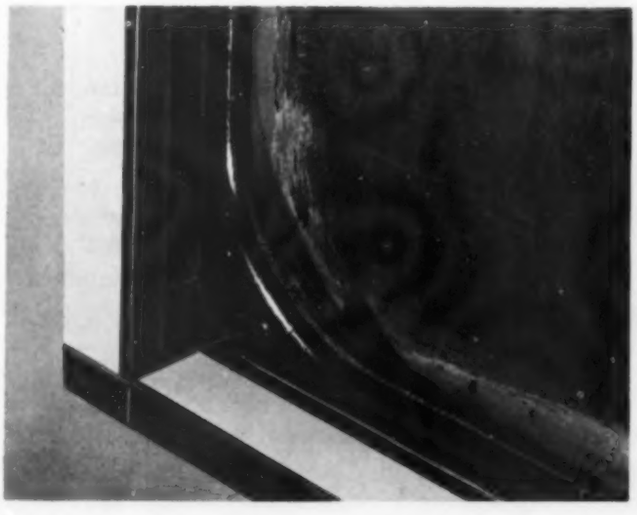
Plastics are again used in the light fittings which are of sand-blasted Perspex (acrylic) and grey cellulose-sprayed metal.

To protect the pale Traffolyte panels below the corridor windows from marking and damage by careless handling of luggage, raised strips of the black phenolic laminate have been superimposed on the flush panels. These strips run continuously down both sides of the corridors and are fixed by counter-sunk screws concealed with plugs.

All notices, lettering and numbers throughout the coach are incorporated in the laminates by a De La Rue process called inter-laminate printing. This is a departure from the standard transfer or engraved printing used in British rolling stock.

S. P. Jordan, A.R.I.B.A., who is staff architect to De La Rue Insulation, Ltd., is the designer of this coach.

Use of urea and phenolic laminates on window sills was of special value because of resistance of the materials to cigarette burns. Screws mounting laminates are countersunk and holes filled with phenolic laminate plugs



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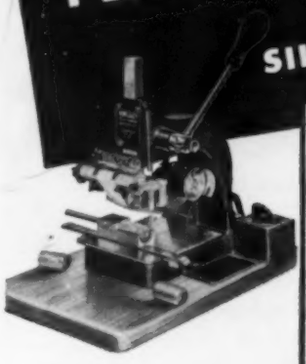

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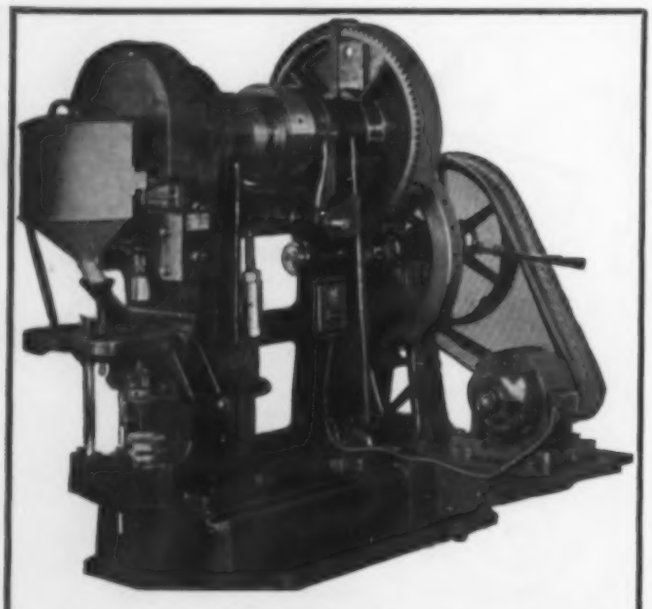

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Here hot water is poured into drip-type coffee unit, consisting of metal cup held by one-piece polystyrene base

One-cup coffee makers

THE TRUE coffee lover, when alone, has long been bothered by the fact that most coffee makers are family sized and cannot turn out just a single good cup of coffee. Two new coffee makers, both incorporating polystyrene in their construction, should fill the need for an in-between-time hot drink.

Both units are the drip type. One is the Cafex Kwik-cup put out by Hartford Products Corp., Chicago, Ill.; the other is the Olde Thompson Little Drip marketed by the George S. Thompson Corp. of South Pasadena, Calif.

Polystrene for both units

Polystyrene was selected for use in these two coffee makers because of its resistance to moderately high temperature, its high luster and variety of colors.

Polystyrene base of the Kwik-cup (above) is molded by Auburn Button Works, Inc., 24 McMaster St., Auburn, N. Y. The molded parts are buffed at the gate mark and assembled to die cast aluminum cups by means of die cast studs which are then riveted to the plastic in a flush position.

Brewing the coffee is a simple procedure. The Kwik-cup is placed over an ordinary cup, filter paper accompanying the unit is inserted and the desired amount of coffee added. Finally, hot water is poured into the Kwik-cup and in a few minutes a steaming cup of coffee

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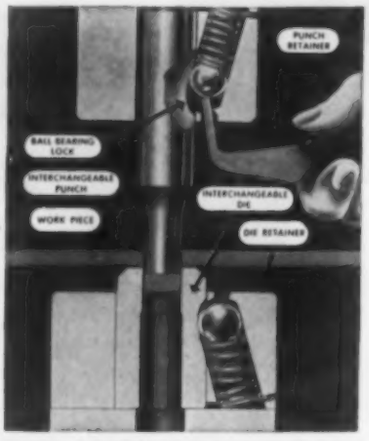

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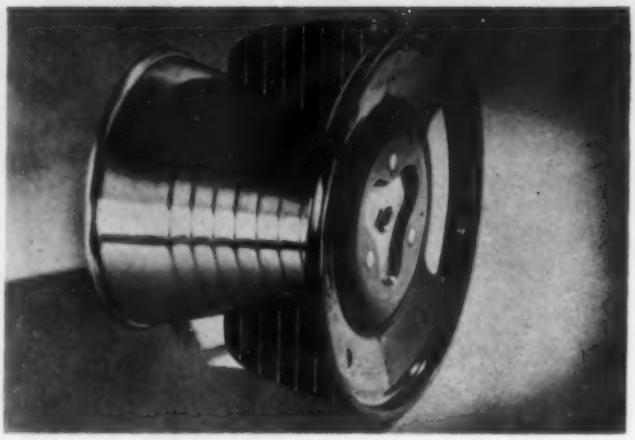

Polystyrene holder, assembled to metal cup by rivets, makes for sales appeal through its color and luster

is ready to be served. Paper with grounds lifts out easily for quick disposal.

The Little Drip (shown below) consists of: 1) a spun aluminum drip top, 2) a polystyrene cover which serves the double purpose of retaining the heat during the dripping process and also as a "no mess" coaster after the coffee is brewed, 3) an 8-oz. glass encased in a molded polystyrene holder with handle. The glass is used as the cup so that there is no pot to wash. By eliminating pouring, there is said to be no loss of flavor or aroma between pot and cup.

The cover and holder are molded of Lustron in a 2-cavity die by B & W Molded Plastics, 1346 E. Walnut St., Pasadena 4, Calif. Both parts are available in red, yellow, green and ivory to complement kitchen and breakfast room colors.

Low heat conductivity of polystyrene is even more important than its attractive color in this coffee maker.

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Taylor Fulscope Recording Controllers are built to master your toughest temperature control problems. Once the desired control point is set, they automatically repeat the same controlled temperature for each cycle. Here are a few of their outstanding features:

1. **Sensitivity adjustment.** Magnified dial calibrated in absolute units.
2. **Automatic reset.** Single continuous adjustment; much wider range.
3. **Pre-Act.** The control effect based on *rate* of pen movement.
4. **Precise set-point adjustments.** Removable plastic knob.
5. **Chart Locking mechanism.** Permits quick, one-hand chart changing.

For any compression-molded product, whether it's a small batch or a long continuous run, you can depend on Taylor Fulscope Temperature Controllers to hold the precise temperatures required throughout the process. This is just another way we're helping the plastics industry to keep quality up and costs down. May we help you? Ask your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, N.Y., or Toronto, Ontario. *Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.*

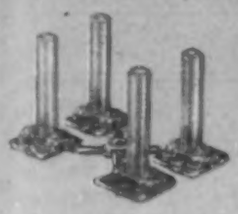
Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

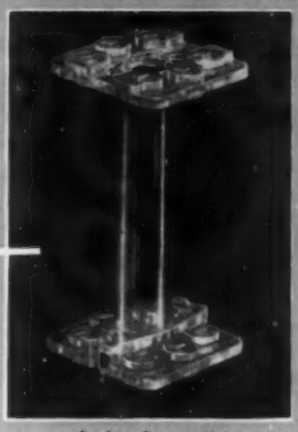
ERIE RESISTOR

Custom Molded Plastics

How *Precise* is Precision?

ERIE RESISTOR
CUSTOM MOLDED
Plastics
REVISE PREVIOUS CONCEPTS





Coil Form, Custom Molded For National Company, Malden, Massachusetts

It's another . . .
ERIE RESISTOR
CUSTOM MOLDED JOB

- NO FLOW LINES
- NO WARPING
- NO BUBBLES
- NO FROSTING

THIS *Big* POLYSTYRENE REFRIGERATOR DRIP TRAY

ER
A SYMBOL OF QUALITY

Better Dies Mean Better Molded Parts

that's why ERIE RESISTOR has its own Die Department

The illustrations give only a hint of the versatile facilities of Erie Resistor for the production of custom molded plastics. A large part of that versatility lies in the ingenuity of an experienced engineering staff which is kept constantly on its toes by getting assignments that have been pronounced "impossible" by less experienced or less skillful operators. In fact such experiences have been so frequent that it has become a byword in the trade that "You don't know it can't be done until you have tried Erie Resistor."

That extra skill may be in molds properly designed by Erie Resistor engineering department. It may be in the precise construction and expert maintenance of molds in our own die shop. It may be in selection of the right plastic for the job, or in accurate control of heat, timing and pressure. Often it's a combination of all these factors that brings the enthusiastic comment, "Erie Resistor has done it again!"

For a practical solution of your custom molded plastics problems come to Erie Resistor.

Plastics Division

ERIE RESISTOR CORP., ERIE, PA.

LONDON, ENGLAND • • TORONTO, CANADA

SMALL INJECTION MOLDINGS

Exclusively!

Special facilities developed solely for production of tiny plastic parts
Surprisingly low mold costs now make short runs economically feasible

- Max. Size -.03 oz., 1¼" long
- Min. size-unlimited
- Low costs on both short and long runs
- Quick service
- Molds made by us
- Injection molding—all thermoplastics

NYLON A SPECIALTY

Complete facilities for secondary and Assembly Operations
SEND PRINTS OR SAMPLES FOR PROMPT QUOTATION, OR WRITE FOR FULL INFORMATION
Also ask for details on our revolutionary companion facilities for tiny zinc alloy die castings

GRIES REPRODUCER CORP.
780 East 133rd St., New York 54, N. Y.

Kill "BUGS" BEFORE MAKING MOLDS

● An accurate, three-dimensional model of your proposed new part eliminates all guess work. It frequently reveals "bugs" and suggests design modifications not apparent from drawings or blueprints.

Insure yourself against costly, time-consuming mistakes by having Stricker-Brunhuber make a plastic pre-mold model of your product. You will be able to test for sales appeal, workability, dimensions, mechanical accuracy, packaging and shipping. Your entire organization will be able to pre-check your product *before production.*

When your pre-mold model is made by Stricker-Brunhuber you know that it meets your every specification.

We Also Make
COMPRESSION AND INJECTION MOLDS

STRICKER-BRUNHUBER CORP.
Mechanical Developers
19 WEST 24th ST. SB NEW YORK 10, N. Y.
WAtkins 9-0191

Consumption of

ALL PLASTICS materials except miscellaneous molding and textile and paper treating resins continued to decline in July from previous months' consumption. A noteworthy factor is that vinyls picked up a few pounds. Producers are inclined to blame vacation periods as a principal factor in decline and insist that August will show improvement all along the line. An interesting set of charts by a chemical company's trade analyst calls attention to fact that

PLASTICS AND SYNTHETIC RESIN CONSUMPTION
From Statistics Compiled by Bureau of

Materials
Cellulose acetate and mixed ester plastics[a]
Sheets
Continuous (under 0.003 gage)
Continuous (0.003 gage and upward)
All other sheets, rods and tubes
Molding and extrusion materials
Total
Nitrocellulose plastics[a]
Sheets
Rods and tubes
Total
Other cellulose plastics, [a, b]
Phenolic and other tar acid resins
Laminating (dry basis)
Adhesives (dry basis)
Molding materials[a]
All other, including casting (dry basis)[d]
Total
Urea and melamine resins
Adhesives (dry basis)
Textile and paper treating (dry basis)
All other, including laminating (dry basis)[d, e]
Total
Polystyrene[d, f]
Vinyl resins
Sheeting and film, including safety glass sheeting[a]
Textile and paper coating resins (resin content)
Molding and extrusion materials (resin content)
All other, including adhesives (resin content)[d]
Total
Miscellaneous
Molding materials[a, g]
All other (dry basis)[d, h]
Total
Grand Total

[a] Includes fillers, plasticizers and extenders. [b] Includes methyl and ethyl cellulose and related plastics. [c] Data cannot be published without disclosing operations of individual establishments. [d] Excludes data for protective coating resins. [e] Excludes urea and melamine molding materials; see footnote *g*.

plastics materials

beginning of plastics decline preceded general business decline by several months. General industry reached a peak of 190 in March of 1947 and slumped to 178 in July according to the Federal Reserve Board Index based on 1935–1939 production. All plastics consumption was at 78,000,000 lb. in January 1947 and dropped to 63,000,000 lb. in June for an approximately 20 percent drop in comparison to the approximate 6 percent all-industry decline.

IN POUNDS FOR JAN. THROUGH JULY 1947
Census, Industry Division, Chemical Unit

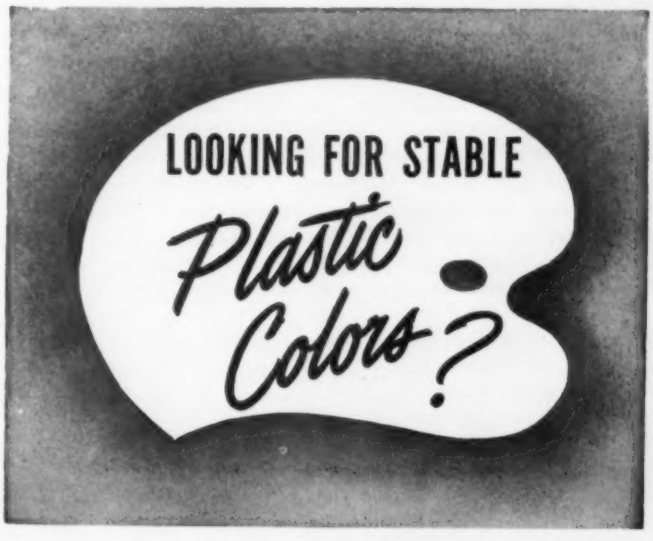
June 1947	*July 1947*	*Total for first 7 months*
lb.	*lb.*	*lb.*
664,506	512,602	4,764,682
662,779	621,823	4,233,566
354,973	275,496	2,556,576
3,735,297	2,943,661	37,552,239
5,417,555	4,353,582	49,107,063
731,502	671,582	5,860,713
199,313	220,641	2,488,009
930,815	892,223	8,348,722
e	*e*	1,685,554[f]
3,696,974	3,146,258	24,250,974
1,587,664	1,521,377	11,935,953
17,294,181	16,638,810	108,550,267
5,187,684	4,643,124	39,867,790
27,766,503	25,949,569	184,604,984
4,235,157	3,872,906	28,129,357
794,438	1,175,423	9,651,112
615,012	473,743	4,838,281
5,644,607	5,522,072	42,618,750
5,954,635	5,687,761	46,549,369
3,914,699	3,721,930	35,229,279
1,083,553	1,537,288	8,748,870
4,937,022	4,567,317	41,240,221
1,610,528	1,746,715	15,296,117
11,545,802	11,573,250	100,514,487
3,915,722	4,118,342	34,199,779
1,974,812[f]	1,810,828	16,338,899
5,890,534[f]	5,929,170	50,538,678
63,150,451[f]	59,907,627	483,967,607

[f] Dry basis, including necessary coloring material. [g] Includes data for urea and melamine, acrylic acid and miscellaneous molding materials. [h] Includes data for petroleum resins, acrylic acid ester resins, mixtures and miscellaneous synthetic materials. [e] Revised. [f] Total, January through April only.

Can your plastic products come through with flying colors when the going gets rough? They can if they're made of Celanese Plastics! For more about these tough cellulosics, see page 9.

Celanese* PLASTICS

*Reg. U. S. Pat. Off.



Then you'll want to investigate *Ferro's inorganic colors*—ideally suited for compression and injection molded plastics. Select from full color range. Colors stable (to 2300 degrees Fahrenheit) and highly chemical-resistant. Write for further details and samples.

Color Division

FERRO ENAMEL CORPORATION

4150 East 56 Street *Cleveland 5, Ohio*

Books and Booklets

Write directly to the publishers for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery.

The Chemistry and Physics of Organic Pigments

by Lyde S. Pratt

Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y., 1947

Price $6.00 **349 pages**

This volume comprises an extensive and analytical review of organic pigments. Although not encyclopedic, the information is drawn from many sources and, in conjunction with the bibliography given, puts within the reader's grasp fundamental knowledge indispensable for practical work or further research in the field. While the information is largely technical, line drawings and photographs throughout the book facilitate its assimilation by students.

A broad historical background is presented and much consideration is given to the relation between color and chemical and physical structure. Chapters on raw materials and intermediates, respectively, contain information on structure, tabular material and charts of benzine, aniline, toluene, xylene, anthracine, naphthalene and anthraquinone sulphonic acid derivatives. Pigments from natural organic colors are discussed in one chapter which is followed by a comprehensive analysis of synthetic organic pigments. In addition to various methods of testing pigments, methods of identification of organic pigments are described and these are exemplified by numerous microphotographs. Pigment types and properties are discussed and tabulated in a separate chapter.

Low-loss plastic insulation materials—Reprints of an article by J. H. Parliman of Plax Corp., Hartford, Conn., on "Low-loss plastic insulation materials" are now available upon request. Properties of plastics which have power factors less than 0.001 at 1 mc. are described and tabulated. Comparable data on the physical, mechanical, thermal, electrical and chemical resistance characteristics of commercially available low-loss plastics for high-frequency circuits and on the economic factors and workability of these materials are provided in the tables.

Translations of German reports—Translations of some of the Kuko (Kunstoff-Kommission) Reports of the I. G. Farben Industries, dealing mostly with plastic and plasticizers, have been prepared by the Accurate Translation Service, Inc., 711 Woodward Bldg., Washington 5, D. C. These reports are known to contain much manufacturing information hitherto not available to American industry. The German originals were released in this country by the Office of Technical Services of the U. S. Dept of Commerce. Twenty-four different reports are available. They range in price from $2 to $15.

Laminating resins—The Plastics Div., American Cyanamid Co., 30 Rockefeller Plaza, New York City, has published a four-color, illustrated booklet on the company's Laminac laminating resins. Applications already in production as well as potential uses for these plastic resins for laminates or formed parts, are discussed.

Processing equipment—Sprout-Waldron & Co., Muncy, Pa., has issued a new eight-page bulletin, Catalog SCEC-4748, illustrating and describing such processing equipment as grinders, mixers, crushers, rotary knife cutters, supplementary equipment and special purpose units.

Coated fabrics—A question and answer booklet on vinyl butyral coated fabrics with suggestions on merchandising is being distributed by the Plastics Div. of Monsanto Chemical Co. at Springfield, Mass. The data are designed to assist department store soft goods buyers in obtaining, promoting and selling this particular product.

Plastics—A new booklet highspotting the special characteristics and combination of properties of Lucite, polythene, nylon, BCM, Strux, Butacite, Pyralin and Plastacele has been issued by the Plastics Dept., E. I. du Pont de Nemours & Co., Inc., 626 Schuyler Ave., Arlington, N. J.

Guide to hydraulic presses—Bulletin No. 147, entitled "Practical facts about hydraulic presses in modern industry," has just been released by Lake Erie Engineering Corp., Woodward Ave., Buffalo, N. Y. This lists the various factors to be considered in the purchase of presses, and covers such subjects as the selection, application, design, construction, testing and installation of hydraulic presses. Profusely illustrated, it serves as a guide for the buyer and user of hydraulic presses.

Buffing and polishing machines—A new 16-page catalog, B-10, illustrating the company line of heavy duty and extra heavy duty buffing and polishing machines has been made available by the Standard Electrical Tool Co., 2470 W. Sixth St., Cincinnati, Ohio. The sizes covered range from ½ to 60 hp. The catalog also gives information on infinitely variable speed buffing and polishing machines with the Speedial control which permits speeds between 1500 and 3000 r.p.m.

Nylon rope—Columbian Rope Co., Auburn, N. Y., has just released an attractive pamphlet on the company's stabilized nylon rope. This rope is said to handle easier than ordinary nylon rope, wear longer, be firm yet flexible and retain its form. Weight and strength of the rope in various diameters is given.

Hydraulic accumulators—A 20-page, two-color booklet containing illustrative and descriptive data on hydraulic accumulators has just been published by Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N. Y. It is intended to acquaint industrial users of fluid power with advantages of incorporating an accumulator in the design of hydraulic machines and circuits. The first part of the publication describes the development of the accumulator while the second shows some typical applications.

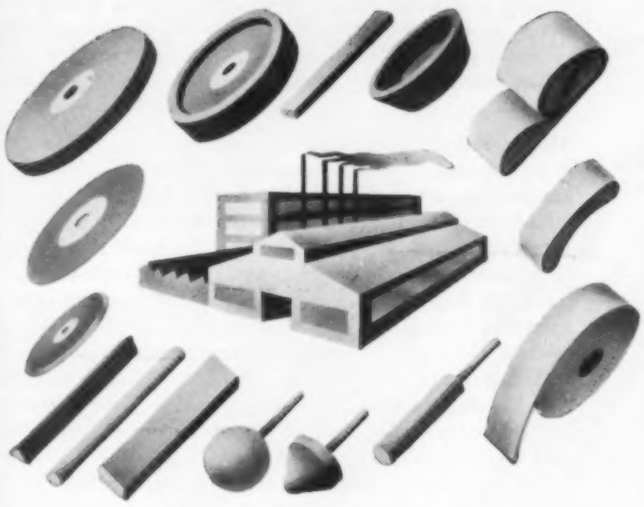
Magnetic separators—Bulletin M-3 of the Bauer Bros. Co., 1773 Sheridan Ave., Springfield, Ohio, illustrates and describes the company's portable magnetic separators for conveyor belts and picking tables, and the triple-air-gap and single-air-gap separators for spouts and chutes.

Geon polyblends—Service Bulletin 45-3A, issued by B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, Ohio, reviews the new Geon 500 series polyblends, a thermoplastic material which should prove interesting to extruders, food packaging, shoe manufacturing and upholstery manufacturing industries. This new material combines chemical resistance of Geon polyvinyl chloride with solvent resistance, flexibility and nonextractibility of Hycar nitrile rubber.

A BUYING GUIDE FOR ABRASIVES

POINT No. 9

COMPLETE LINE OF ABRASIVES



The Carborundum Company makes the only complete line of abrasives produced under one trade mark.

With industrial techniques utilizing a wider variety of different type abrasives, it is only logical that users turn to The Carborundum Company as the one primary source for all abrasive needs. Product quality is known and highly regarded. Specialized service on all abrasive problems and applications is covered by experienced representatives who are free to recommend the best abrasive products for your requirements. Satisfaction is assured. Of even more importance to many, responsibility is definitely fixed and undivided. For reasons such as these, there is an increasing preference for products by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

A Good Rule for Good Grinding...CALL IN

CARBORUNDUM

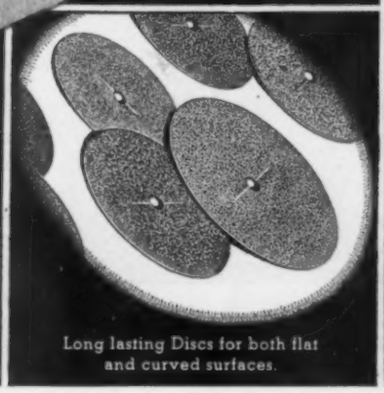
TRADE MARK

- BONDED ABRASIVES
- COATED ABRASIVES
- ABRASIVE GRAINS AND FINISHING COMPOUNDS

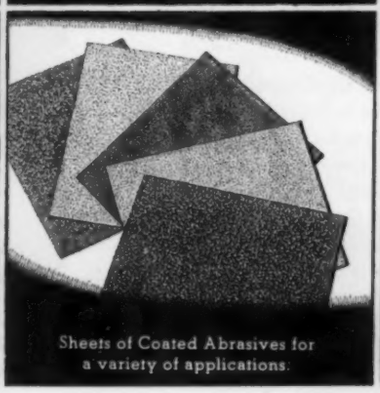
A Coated Abrasive for every sanding and finishing condition.

All standard shapes are supplied in grinding wheels by CARBORUNDUM.

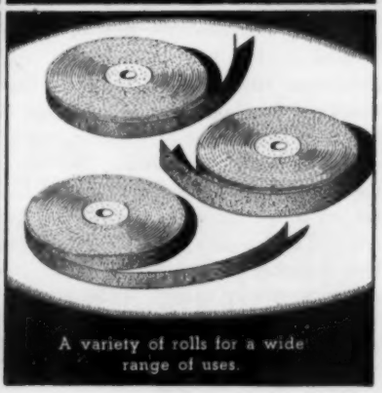
"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company.



Long lasting Discs for both flat and curved surfaces.



Sheets of Coated Abrasives for a variety of applications.



A variety of rolls for a wide range of uses.

New Machinery and Equipment

Four-oz. injection molding machine—Reed-Prentice Corp., Worcester 4, Mass., has added a 4-oz. capacity machine, the 5A, to its line of injection molding machines to meet requirements of the foreign markets and captive plants with limited production. Specifications include: cubic in. molded per shot, 5.3; plasticizing capacity per hr. (dependent on product and mold construction), 30 lb.; maximum pressure on material, 16,000 p.s.i.; size of die plates, 16 by 21 in.; maximum die space, 12 in.; maximum shots per hour, 350; die locking pressure, 100 tons and

floor space, 148 in. long by 50 in. wide by 75 in. high. It has centralized controls, sturdy mold locking mechanism, fast toggle action for mold closing with retarded closing action to prevent clashing. Mold space is quickly adjustable to suit molds by means of a single central adjusting screw. The stationary die plate can be easily moved away from the nozzle by means of a hand lever. Automatic ejection is provided by two push rods. The base is of welded steel construction with integral oil tank. Oil can be filtered before it enters the hydraulic system.

Poppet type valve—Ross Operating Valve Co., Dept. K, 6471 Epworth Blvd., Detroit 10, Mich., has introduced a new small poppet type valve designed for operation of light machine tools, vises, fixtures, presses and other machinery adaptable to air control. It is constructed of brass and stainless steel with a hi-carb neoprene valve seat. Four styles are available. In the foot treadle style, No. 600 is the 3-way, No. 601 4-way; in the hand lever type, No. 602 is 3-way and No. 603 4-way. All are available in locking, non-locking or neutral-type positions.

Precision surface grinder—The finger tip control of the conventional hand-operated grinder and the automatic power feeds found in hydraulically powered machines have been combined in Model GH-1 "Handraulic" surface grinder just announced by the DoALL Co., Des Plaines, Ill. Instead of a handwheel connected to the table by rack and pinion, the grinder has a direct coupled hydraulic cylinder to power the table movement. Starting, stopping and reversing of the table is controlled by self-centering 4-way valve. Table speeds infinitely variable from 5 to 50 ft. per min. are obtainable. New type combination trip dogs regulate length of table travel. The manually operated 1-in. crossfeed screw is located in the center between the cross ways and is graduated in increments of 0.001. With the built-in vernier, settings to 0.0001 are possible. Standard equipment includes a cartridge type precision ball bearing spindle directly driven by a 1-hp. motor. A separate $^{3}/_{4}$-hp. motor drives the hydraulic pump. The GH-1 comes equipped for dry grinding. Splash guards and a coolant unit are available for wet grinding.

High speed plunger press—A new 150-ton plunger press which is an adaptation of the company's standard semi-automatic compression press is offered by the F. J. Stokes Machine Co., Philadelphia 20, Pa. Toggle action is utilized to lock the mold shut. The plunger cylinder is mounted on the head of the press and single motor provides power to two pumping units for actuating the toggle lock and applying ram pressure, respectively. Electronically heated preforms may be used. With this press, the method of loading is optional. A preform may be placed in a centering ring of the lower die when open. The die is then closed, with the plunger ram immediately engaging the material from its partially retracted position of the previous cycle. In the alternate method, the die is closed empty and a preform, or powder charge, is loaded through the top of the die between the upper bolsters. With either method the cycle is automatically controlled by a bar-type controller.

Manually controlled timer—A timer for machines such as washers, chargers and extractors or any electrically energized machine which is turned on and runs a pre-determined time has been introduced by Eagle Signal Corp., Moline, Ill. It is synchronous motor driven, thereby eliminating springs and escapements. Other features include large pointer, optional "hold" position, multiplicity of dials, optional stop lever.

Sheet plastic beading machine—An improved machine for beading straight edges of thermoplastic-type sheeting of 0.005 to 0.020 in. thickness on a high-speed, uniform production basis has been introduced by the Sheet Plastics Equipment Div., Taber Instrument Corp., 111 Goundry St., North Tonawanda, N. Y. This unit, called the Thermobeader, is designed to bead cellulose acetate, ethyl cellulose, vinyl acetate, cellulose nitrate and similar sheet stock, roll material, die-cut blanks and strips at the rate of from 500 to 1000 in. per min., depending on the type and thickness of material in process. When used with certain forming and cooling die combinations it forms nine standard beads. These range from $^{1}/_{16}$-in. round, $^{3}/_{32}$-in. superflex and $^{1}/_{8}$-in. square inside corner types to $^{3}/_{16}$-in. square inside corner bead, narrow flat type of $^{3}/_{32}$ to $^{1}/_{4}$ in. width and $^{1}/_{8}$-in. recessed

6 AT A TIME . . . 70 SECOND CYCLE with Automatic Molding

Here is a molding, by Pass & Seymour, Inc., Syracuse, N. Y., typical of the numerous electrical components made by this company, *Molded Automatically because this is the most economical way to produce such parts.* Here again the economies of Automatic Molding are forcibly demonstrated.

- Lowest labor cost.
- Highest quality parts, no assembly difficulties.
- Small mold, 6 cavities only.
- Production geared to requirements, no large inventory.

Pass & Seymour were among the first users of Automatics . . . now operate 9 of these presses, 3 shifts, with 1 unskilled attendant per shift. A skilled molder sets up and times the machines. There are many other advantages also. We should like to discuss them with you and make cost studies and recommendations.

Stokes No. 235 50-ton completely Automatic Molding Press. Patented in U. S. and abroad.

F. J. STOKES MACHINE CO., 5934 Tabor Road, Phila. 20, Pa.

Branch Offices in New York and Chicago

F.J.Stokes MOLDING EQUIPMENT FJS Est. 1895

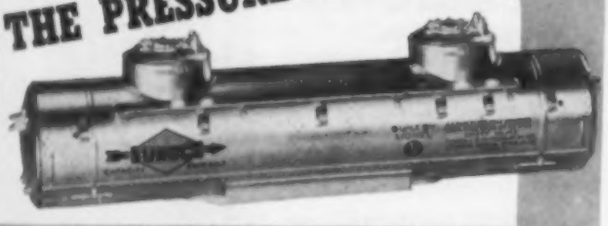
Special types have been developed for each plastic

Pearl Essence

THE MEARL CORPORATION

153 Waverly Place New York, N.Y.

THE PRESSURE-PRINT PROCESS



for GLASS • PLASTICS • METAL

PRESSURE-PRINT is a special printing method we have developed for reproducing any number of colors on any shape and size of container. Good for glass, plastic or metal.

We can install this process in your plant and teach your operators how to reproduce in perfect registration any number of colors.

Or—if you would like to see how PRESSURE-PRINT will look on your container, we can do the work for you in our plant.

PRESSURE-PRINT process is impervious to oil, alcohol and water. Doesn't rub off, stays brilliant. Investigate PRESSURE-PRINT today.

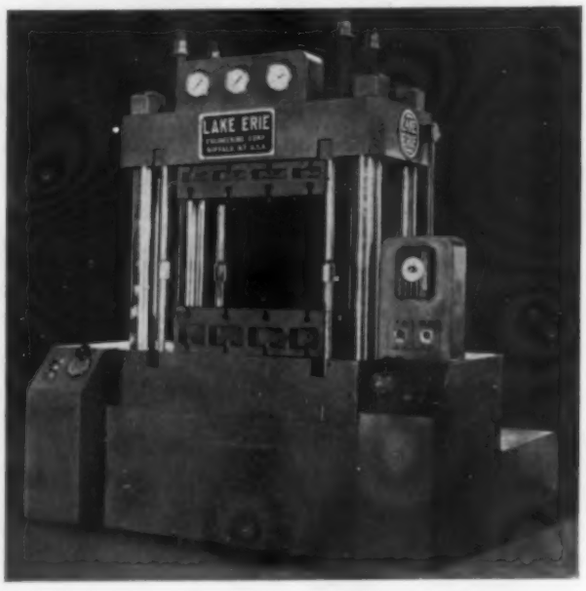
Multi Color Graph CORP.

Delaware 3-4445 397 Halladay St., Jersey City 4, N. J.

Machinery

cardboard snap-in type bead, used for inserting the bottom of circular containers. The machine has automatic die temperature control and variable transmission.

Upstroke duplex molding press—A new press which has an upstroke duplex ram mounted inside the main ram and which uses a jack ram to provide a rapid approach stroke has been announced by the Lake Erie Engineering Corp., 869 Woodward Ave., Buffalo 17, N. Y. The press is a single action, self-contained, semi-automatic model. The main ram has a capacity of



200 tons with a 20-ton pullback. The duplex ram has a 50-ton capacity with a 10-ton pullback. Grids measure 30 by 24 in. with 30-in. daylight between grids. The main ram has a 14-in. stroke; the duplex ram an 8-in. stroke. Control of the press is accomplished entirely by push buttons with automatic timers, stripper reset and limit switches for upstroke, return stroke and slowdown. It is designed for duplex or compression molding.

Rotary work table—H. P. Preis Engraving Machine Co., 155 Summit St., Newark 4, N. J., has introduced a 5-in. diameter rotary work table for engraving, profiling, graduating, milling and drilling on circular name plates, dials, round dies or any object requiring circular or semi-circular cutting. It is said to be adaptable to almost any engraving machine. It can be used on small production milling and drilling machines where, it is claimed, layout work can be reduced on many types of job. The outer rim of the turn table is marked in degrees and numbered at every tenth degree. Every degree is notched. The index unit can be disengaged for free turning, using a cam-

PRECISION AND QUALITY

YARDLEY "TRU-SIZE" TUBING

Speed up production, cut costs, by using only tubing of absolute uniformity. Polarized light tests consistently prove Yardley "Tru-Size" tubing has proper density and hardness characteristics plus freedom from strain patterns.

Tolerances are held to plus or minus .003" assuring better alignment when used with injection molded parts.

You can count on better machining qualities, high-dimensional stability and high-gloss, mold-like finish when you use "Tru-Size" tubing.

Made in continuous lengths, standard wall thicknesses, O. D. ⅜" to 2". Used everywhere by particular manufacturers for pen and pencil barrels, radio and electrical parts, instrument handles, irrigation tubing, better toys, novelties and many other fabricated products.

Send for bulletins on stock shapes. Consult us on special shapes.

YARDLEY *Plastics Co.*

142 Parsons Ave. • ADams 9135 • Columbus 15, Ohio

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Skilled, master craftsmen design, create and carve plastic decoratives of exquisite beauty to serve individual requirements.

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W. L. STENSGAARD AND ASSOCIATES, INC.

300 N. JUSTINE ST. • CHICAGO 7, ILL.

In Hundreds of Plants Like Yours

SKIN IRRITATIONS

HAVE BEEN STOPPED THIS WAY

Tarbonis has solved the costly problem of industrial skin irritations in hundreds of plants just like yours. Presenting an extract of tar in a greaseless, odorless, colorless vanishing cream base, it does not soil skin or clothing. It disappears quickly after mild rubbing, hence does not interfere with workers' efficiency. Tarbonis not only clears up many skin reactions due to irritants used in industrial operations, but helps prevent them too.

Send for a sample of Tarbonis TODAY

THE TARBONIS COMPANY

4300 Euclid Ave. • Dept. MP • Cleveland 3, Ohio

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Company.....

Address.....

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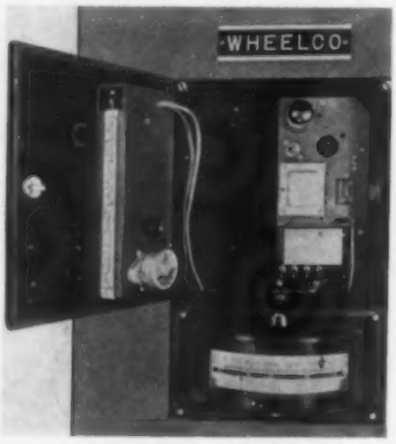
Are These the Irritants?

Cutting Oils
Chrome Dyes
Formaldehyde
Sodium Bichromates
Lime
Metal Dust
Chemicals
Urea and Phenol Plastic Compounds
Brine
Acid-Type Foods
Foodstuffs
Reagents
Naphtha
Soaps
Detergents

Machinery

lock to secure the turn table. Working surface is provided with four tee-slots for 1/4-in. bolts and a 5/8-in. diameter hole for centering the work with a stud. The overall height is 1 3/4 inches.

Strip chart recorder, and time and operational recorder—Wheelco Instruments Co., 847 Harrison St., Chicago, Ill., has announced the Capacilog, a new type strip chart recorder, and the Time-o-Log, a new time and operational recorder. The Capacilog, shown here, is designed for the measurement indication control and permanent record of the variables in the process industries. It operates on an electronic principle, successfully applied to the company's Capacitrol pyrometer controller. A recording function with a positive power-driven pen has been added to the electronic link between measurement and control for deflection and null method types of measuring systems. The Capacilog is available as a deflection, potentiometer or resistance thermometer type recorder, recording controller or as an indicating controller.



The Time-o-Log utilizes a synchronous motor to motivate a 3/4-in. wide strip chart at a speed of either 2 or 4 in. an hour. A small electrical current (5 watts) moves the pen when contact is closed, providing immediate response to operation action. It may be used to check an unlimited number of industrial machines such as injection, extrusion, compression plastic molding and die casting machines, punch presses, hydraulic presses and various conveyors and material handling machines requiring information pertaining to start and stop time, number of units produced and shut-down idle time.

Automatic engraving and profiling machine—Airdraulics Inc., 100 W. 101st St., New York City, has recently introduced an automatic engraving and profiling machine which can be used on almost any type of material and product. Besides engraving in 1:1 ratio (profiling), the machine, supplied with a Pantograph, allows engraving in desired reduction to a 3:1 ratio. The adjustable vise of the unit will hold work up to 5 by 8 in. and the machine will engrave areas up to 4 by 4 inches. A micrometer depth adjustment device allows engraving from hairline to deep cut. Convex or concave surfaces can be covered from a flat master, with uniform thickness of the engraved line. The work table, with adjustable rulers and instantaneous camlocks, permits the operator to assemble templates in a few seconds.

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Letters

This section, appearing periodically, is devoted to excerpts from letters that seem of industry-wide interest

What's in a name?

Dear Sir:

Some of the boys had quite a session last night and we decided that it might be a good thing for your organization to do something about this word, *Plastics*. This particular terminology is at the present time inducing a slight consumer antagonism.

The use of such a trade name as *Lustron*, *Fibestos*, etc., is not a very happy substitute since all of the raw material manufacturers call their molding powders by a different name. We wondered if it would be a good idea for these people to get together and decide on some similar advertising name for material such as polystyrene and acetate. If this could be done, the fabricators could easily adopt the same name and thus establish consolidated action for the selling of this particular brand name to the consumer.

For example, if all polystyrene were called *Lustron* and this name were adopted by Dow, Monsanto and the others, and then was used by all fabricators, we believe we could relieve the consumers of some degree of their antipathy for the word *Plastics*, and still sell them on a different trade name.

Albert J. Gottlieb
E. B. Kingman Co.
Leominster, Mass.

Mr. Gottlieb expresses himself on a subject about which there is much talk but little action. We think the prejudice he mentions is due more to confusion than to antagonism. Something may come of it yet. S.P.I. has recently taken steps to study the whole matter of informative labeling and recommend action to be taken.

Polystyrene on the pan

Dear Sir:

In the July issue of Modern Plastics you have an article entitled, "Why polystyrene tableware?" I take it from the title that the author was sort of groping in the dark and wanted an answer to the question.

Here's my answer. The constant use of polystyrene tableware will force the customer to learn to enjoy the pleasure of lukewarm coffee, chilly bacon and cool soup. Doctors say we eat too many hot foods anyway. No other tableware can make that statement. Also the use of this tableware should force the meat packers to bring out a line of precut meats which will in turn allow the public to throw away their cutlery and use our line of polystyrene cutlery (now on the drawing boards).

I am mailing you some samples of the tableware so highly recommended in the article. In using these samples I forgot myself and, instead of allowing the coffee to cool in the pot, I poured it right out (temperature about 180 to 190° F.). My wife forgot herself one morning and put hot bacon on the plate (approximately 200° F.). I went ahead and made the same silly mistake with my soup. I should have had my butler use the tureen instead of pouring it directly into the bowl (temperature 180° F.).

May we suggest that you approach the manufacturers of this plastic misfit and advise that they furnish a thermometer with each set, and that they recommend the use of our new line of cutlery rather than those hard, old metal things that scratch up their nice plates. I know that I should have tested these dishes for the two years that the article mentions they will last, but after five weeks my wife was going to let the dog test them. I've always been a lover of dogs so before he gets them I'll send them on to you.

I'm afraid we have a little waiting to do before we can say any presently known thermoplastic can be recommended for tableware. Of course I wish this were not so because we want to see plastic molders utilizing every machine they now have and come into the market for more.

It's the first time I'm chalking up a grade *A* boner against MP on my scoreboard, and it hurts—way down deep. There are thousands of sound, unknown uses for plastics, and plastics should only be used when they are the best material for the application.

Elmer C. Maywald
Chicago, Ill.

Mr. Maywald thinks our editorial acumen slipped a cog. The article in question was presented merely as a report of an interesting application for polystyrene—it was not an official endorsement of the product. We are not endorsers of any plastic product but reporters of what is going on in the industry. The development of polystyrene tableware has reached such a stage that the manufacturer has increased his facilities; the industry has its eyes on the application either for better or for worse. There's nothing like a good little shindig to arouse attention. Is there a reader who would challenge Mr. Maywald's searing blast?

Japanese in business

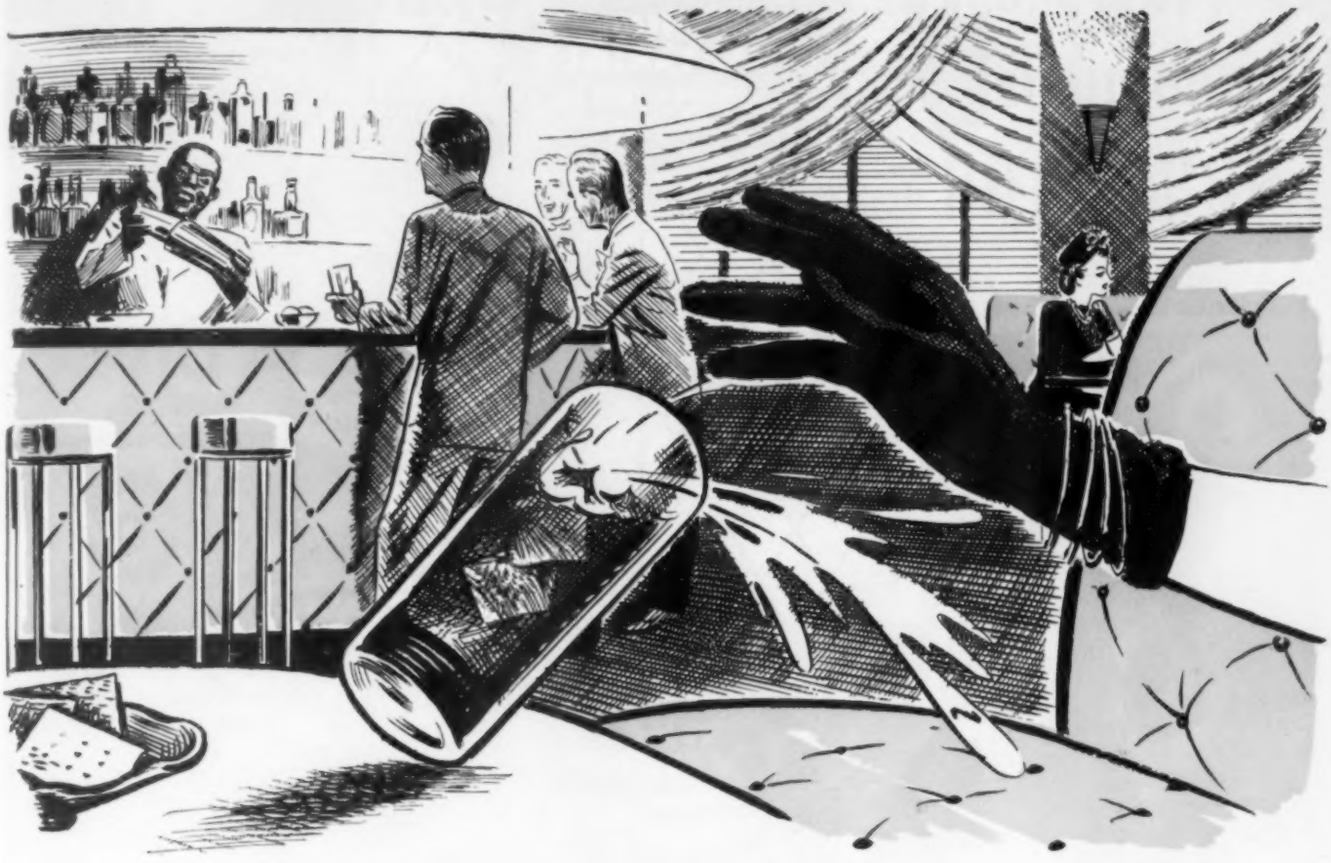
Dear Sir:

As an old direct subscriber to the Modern Plastics in prewar time, we have a long-cherished desire to enter into plastic business again with your country. The plastic industry in this country has also been unable to be freed from the war damage, and no distinguishable progress has been made through the inability of keeping close touches with any fresh informations from your country. However, we are very much desirous to start again in direct touches with your suppliers.

Taking advantage of this opportunity, we would ask you to kindly arrange for us so that we may hear from some of your manufacturers of crystal-clear plastics, preferably of methacrylate groups, and also we may have some sample blocks together with prices and descriptive literatures. The materials imported will be finished here as ornaments, decorative and smokers' accessories, toilet article parts and other fancy-works in variety, where the glass-clearness is first of all required. Please add also that the material which we require is in sheets of 2 mm. to 15 mm. thickness and 200 mm. square or more.

N. Hashimoto
Mgr., Import Dept.
Nagase & Co., Ltd.
Itachibori Minamidori 1-chome
Osaka, Japan

Mr. Hashimoto raises a touchy point. Some American molders and fabricators are not applauding the possibility of imported plastics items reaching this country in large quantity.



Here's a Material that's "Teetotal"!

● Highballs affect this versatile vinyl plastic as little as water — and that means not at all! No stains — no deterioration of material.

It's a good example of how resistant *Resproid* is to dirt and wear and tear of all kinds. *Resproid* is practically scuff-proof. You can bang and scrape it and still leave no mark. It's almost impossible to crack, and *Resproid* resists fading, scuffing and abrasion — perspiration, acids, alkalies and oils.

Now, you can say all that about a piece of armor plate. But when we add that *Resproid* is one of the loveliest materials you've ever seen, you can begin to realize *Resproid's* profit possibilities for you.

Resproid comes in a rainbow of jewel-like colors and pastel shades — in a wide range of styles. Translucent plastic films that are ideal for curtains and waterproof garments — smart leather and reptile grains that set a new high in style for handbags and luggage — heavier films and plastic coated fabrics that bring new beauty to a variety of products as wide as your imagination.

Whether you're looking for new products to make or new ways to improve your present lines, *Resproid* offers you a whale of an opportunity. Send for samples and see for yourself — today!

● *Made in a modern, fully-equipped factory under strict laboratory control,* **Resproid** *is compounded of high molecular weight resins which can be processed only on the latest plastic equipment and which give greatly superior wearing qualities. Insist on the name* **Resproid** *whenever you order plastics.*

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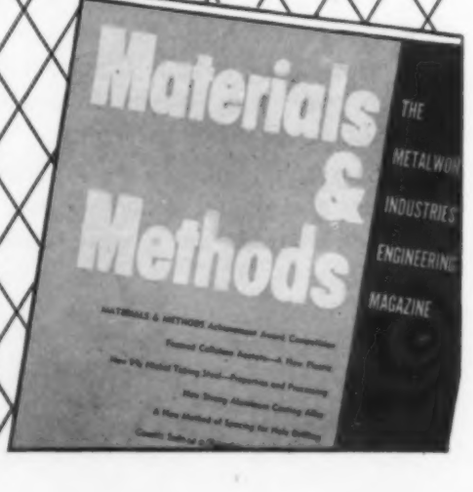

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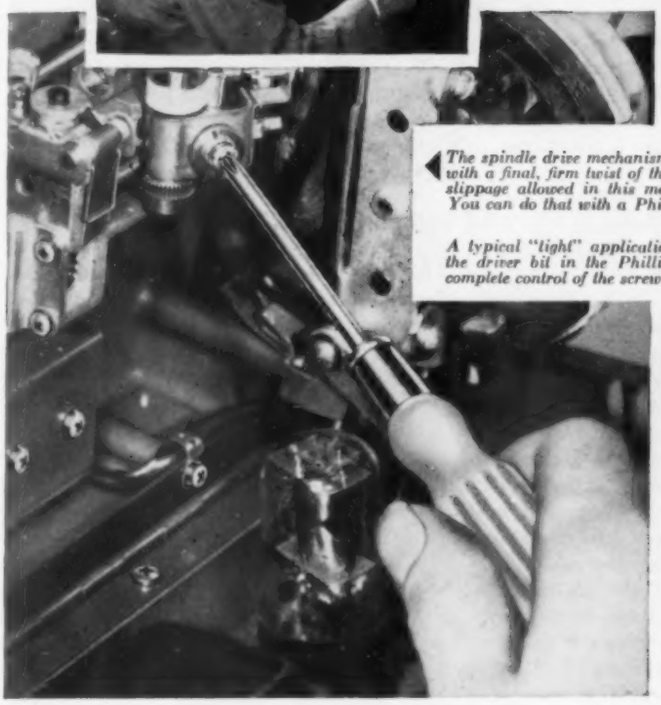
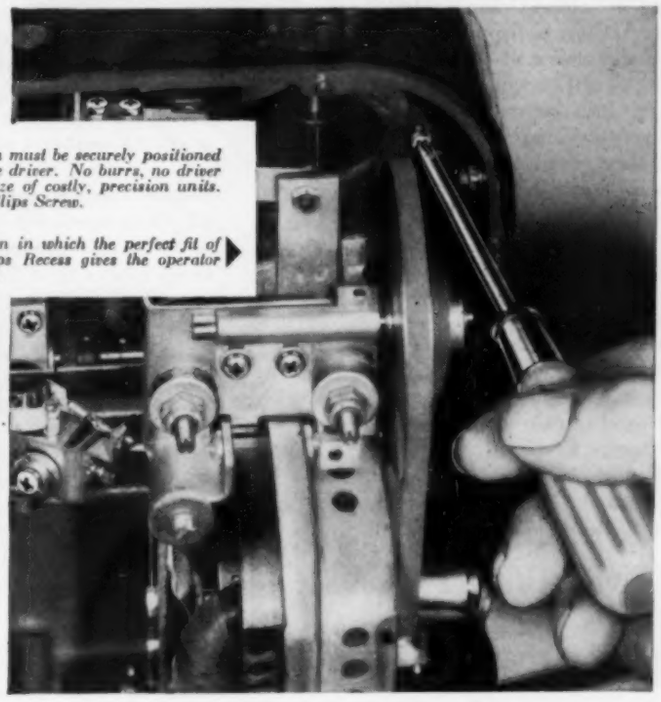


The spindle drive mechanism must be securely positioned with a final, firm twist of the driver. No burrs, no driver slippage allowed in this maze of costly, precision units. You can do that with a Phillips Screw.

A typical "tight" application in which the perfect fit of the driver bit in the Phillips Recess gives the operator complete control of the screw.



"OUR MAJOR PROBLEM on the Audograph, an advanced electronic soundwriting machine," explained Gray's chief engineer, "is assembling small precision components without disturbing fine tolerance or damaging highly finished surfaces. Phillips Screws are the surest solution of that problem.

"PRECISE ASSEMBLY EASIER WITH PHILLIPS. The perfect fit of the driver in the recessed head speeds finding the thread. Operators easily position each component precisely. Driving in constricted places and at angles is far easier with Phillips Screws.

"AVOID DRIVER SLIPPAGE. 'Skids' would be very costly where so many precision units and expensively finished parts are compactly assembled. The cost of such damage would be out of all proportion to the cost of the parts . . . when interruption of our production due to disassembly and reassembly is figured in. At several points even a slight burr on a screw head could disturb the precision of a vital part. Phillips Screws remove the possibility of such damage.

"PHILLIPS HEAD IS PART OF SMOOTH STREAMLINING. The neat, modern appearance of the recessed head complements the ultra modern design of the Audograph."

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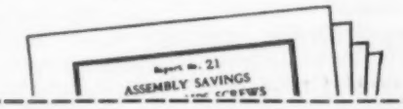

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MP-22

The Plastiscope*

INTERPRETATIONS OF THE CURRENT NEWS

BY R. L. VAN BOSKIRK

1948 plastics exposition

The Third National Plastics Exposition will be held at Grand Central Palace, New York City, in September 1948, according to the chairman of the exposition committee of The Society of the Plastics Industry, Inc., Nelson E. Gage of American Insulator Corp. "We polled the industry's former exhibitors and their response showed a preponderance of opinion in favor of New York as the logical location for the next national show," Mr. Gage stated.

Members of the S.P.I. Exposition Committee are: Chairman, Nelson E. Gage, American Insulator Corp.; Allan Brown, Bakelite Corp.; R. L. Gibson, General Electric Co.; Dennis C. Guthrie, Eastman Kodak Co.; J. R. Hoover, B. F. Goodrich Chemical Co.; D. S. Hopping, Celanese Plastics Corp.; E. J. Pechin, E. I. du Pont de Nemours & Co., Inc.; James R. Turnbull, Monsanto Chemical Co.; and A. G. York, Watson-Stillman Co.

Vinyls down but not out

The impression has been getting around that vinyls were taking a terrific drubbing, but Government figures on resin production indicate no collapse. Though poundage has dropped from a high of over 17,000,000 lb. in January to 11,500,000 lb. in June, the percentage drop is no more than in some of the other plastics.

The significant thing is that the July 1947 figure was a few pounds above June, and it is believed that when figures are published, August poundage will be higher than July, with September showing the same proportion of rise as in other plastics. The Government figures on vinyls are confusing and probably not entirely accurate, but it is believed they show the trend.

It seems certain, however, that consumption of vinyl resin will come nowhere near the goal of over 200,000,000 lb. set for 1947. The capacity may be there, but consumption is something else again. Competitors say it is probable that both Bakelite Corp. and B. F. Goodrich Chemical Co. will have doubled their 1946 capacity for vinyl chloride to at least 170,000,000 lb. by the end of 1947; the Goodyear Tire & Rubber Co. will have sizable capacity available; the Glenn L. Martin Co. will be ready to begin production early in 1948. Monsanto Chemical Co. will reportedly be in production in six or seven months.

Outlets for vinyl chloride—As far as outlets for vinyl chloride resins—the principle factor in the vinyl field—are concerned, the indications are that cable and wire covering still head the list.

Calendered material is the next greatest outlet and includes film, sheeting and coated fabric. However, there are many bright prospects for other applications.

Garden hose—Garden hose is an example. Largely a novelty in 1946, it took hold so well that 1947 production was four or five times greater than 1946. The amount of compound per 50 ft. of hose varies, according to the manufacturer, all the way from 7½ to 15 lb. One processor has been using from 25,000 to 30,000 lb. of compound per month. The larger manufacturers of garden hose have not yet taken vinyl hose to their bosom but are eyeing the field. They are reportedly amazed at the alacrity with which the public has taken up the new material despite its increased cost. Apparently, the public likes the color, lightness and cleanness of the plastic hose. And the one glaring defect in the early product has been overcome—a tendency for the couplings to come loose. This drawback has been eliminated through the use of airplane-type, conical-shaped metal couplings with expansion rings.

When and if the old-time large manufacturers adopt vinyl for garden hose, the consumption of compound should be at least three times present usage. In 1939, for example, the total weight of finished garden hose manufactured in this country was 45,533,630 lb., and the value was $6,471,085.

Flooring—Another potentially large outlet is flooring. Flooring manufacturers have been slow to get into production on a large scale due to lack of raw material and installation of processing equipment.

It has been estimated that by the middle of 1948 there will be as much vinyl going into flooring as into any other item.

Patent plastic—Another vinyl product that has held up surprisingly well has been patent plastic. Producers expected a severe decline this year because they felt that processors had gone overboard on patent plastic in 1946 when it was estimated that they used somewhere between 30,000,000 and 50,000,000 square feet. The largest sale of patent leather ever recorded is somewhere within the 30,000,000-sq.-ft. bracket, but almost no patent leather was sold in 1946 for handbags. The 1947 figures are not available.

It has been stated that a great foreign market for patent plastic may be built up in tropical countries where the natives are fond of bright, shiny colors and where patent plastic has a great advantage over patent leather because it does not mildew. Europe, of course, is not a great market at the moment though, surprisingly enough, Sweden was one of the largest importers of this material in 1946.

Shoes—The use of vinyl resins in shoes is still in the developmental stage due to such problems as proper lasting, lack of breathing for uppers, competition from synthetic rubbers, and a tendency for vinyl soles to crack after long wear, even though they will actually outwear most other materials. This last problem will probably be eliminated by some type of laminate.

There is every reason to believe that vinyls will be in the shoe field in a big way within the next 5 years. It's a nice market—more than 400,000,000 pairs of rubber heels and soles were made in 1939 and sold at a value of almost $30,000,000. Vinyls, of course, do not ever expect to take over the entire rubber field in shoes, but if they ever succeed in producing satisfactory uppers and soles, they will make quite a large dent in both the leather and the rubber output.

Unsupported vinyl film and sheeting—One of the most controversial subjects in the plastics industry still concerns the use of unsupported film and sheeting. The difficulty stems largely from the fabricating of these materials. There are many problems involved in heat sealing and sewing these materials.

In vinyl sheeting used for upholstery, there is considerable trouble over unsupported sheet because of the sewing problem but observers believe that any prejudice can be overcome when upholsterers are taught how to handle the material. An educational program is sorely needed for this purpose. There has been much talk concerning the decline of unsupported vinyl film upholstery, but there were 23 furniture manufacturers exhibiting furniture upholstered with it at the High Point, N. C., furniture show.

The problem can be overcome by using round needles, nylon thread, fewer stitches per inch, elimination of sharp corners and various other simple methods. But upholsterers who have always worked with

* Reg. U. S. Patent Office.

Before

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Long before the "man in the Brown Derby" became front page news, General Industries was making molded plastics parts for manufacturers who have since become veteran customers.

In 1924, for example, we molded the first brushholder for the Lamb Electric Company of Kent, Ohio. And we're still making that same part for them today! That's typical of the genuine molding satisfaction General Industries consistently renders to all its customers. They, in turn, know they can rely on this dependability to help them make their products better . . . and keep *their* customers satisfied.

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The Plastiscope

fabric or upholstery will never learn these things unless they are taught.

Vinyl controversy

In a sharp-toned release, Bakelite Corp. has come out swinging with a statement aimed at claims made in this magazine and others asserting that the B. F. Goodrich Chemical Co.'s vinyl paste resin was the first of its type in the United States. Their notice declares that Bakelite Corp. was marketing a vinyl chloride acetate resin designed for dispersions use early in 1944, and that hundreds of thousands of pounds of "Vinylite" resin-plasticizer pastes had been shipped to wire and cable companies. The material was called a "plastisol" and used as cable filling compounds in United States Navy cables.

Bakelite's C. W. Patton is quoted from an address given on March 8, 1946, that "these resins are available as dry white powders. One of these resins can be utilized simply by dispersing it in plasticizer together with appropriate fillers, pigments and stabilizers on a 3-roll mill to form a paste."

There is nothing like a good, old Brooklyn Dodger rhubarb to stir up interest in a ball game, a political contest, a bankers' convention or a plastics product. May we venture the opinion that there will be more activity in this particular branch of the vinyl industry in the next few months than there has ever been before, no matter who made them first or whether they are called paste, plastisols or organosols.

White wall disks

There has been considerable talk in the industry concerning the use of plastic white wall disks for automobile wheels. Because of conflicting statements that have been made concerning the utility of this item, we have written to the manufacturer and received this report:

Cellulose acetate butyrate white wall disks have been in satisfactory use on automobile wheels since March 12, 1946. The company is producing at the rate of 250,000 per month. Three leading automobile producers have given assurance that this plastic material has performed satisfactorily over the past 16-month period.

During the year 1946, more than 8,000,000 metal white walls were manufactured, and something like 5,000,000 will be produced in 1947. The metal was used because of plastic shortages and inability to get into plastics production early enough. The company is advertising metal disks at this time, but this is in no way delaying the development of the plastics program. Mass production machine methods are being devised for plastic white wall disks.

Dow and National Plastic

The freight-carload of rumors concerning the organization of a new company by Dow Chemical Co. and the National Plastic Products Co. of Odenton, Md., was finally unsealed, although the revelation still was buried deep in Dow's 50th Annual Report. It announced that the Saran Yarns Co., organized and owned jointly by the Dow Chemical Co. and the National Plastic Products Co., had been set up in Odenton, Md., to manufacture fine fibers out of Saran. It is understood in the trade that the fibers are not multifilaments, but rather very fine monofilaments which may be woven into upholstery, draperies and gossamer fine materials which may eventually be used in stockings. F. L. Brown, formerly Eastern regional manager of Plastics Div. of Dow's New York office, has joined the new firm.

New plastic dental plate

A new type of plastic dental plate has been perfected by Dr. LaMar Harris of Chicago, Ill., and Dr. Lloyd W. Colton of Hawaii. It is composed of three plastic laminations. The first, or outside layer, is comprised of acrylic. The second or adhesive laminate, is formed of finely woven (108) glass fabric impregnated with vinyl butyral, with a phenolic modifier added for stiffness. The third layer, or the one next to tissue, is a combination of acrylic and polystyrene. The polystyrene in layer is not to exceed 20 percent of the compound and is used primarily to decrease water absorption.

Dr. Harris' patent says a denture made by above method will practically eliminate the danger of warpage and consequent rocking of a dental plate.

This combination of various types of plastics is not necessarily limited to dental field. Similar combinations are said to be useful in certain military applications.

Plastic combinations

When speaking of using plastics in combination, it is wise to proceed cautiously, according to various materials' producers.

Don't touch—It is now well known that cellulose acetate and polystyrene should not be generally used together because the plasticizer from the acetate is likely to fog the polystyrene when the item is exposed to high heat.

Another example of "don't touch" is polystyrene and vinyl. Garment hanger people are complaining that vinyl garments, when hung on polystyrene hangers, are likely to absorb some of the hanger's color. It is also reported that if a careless dry cleaner leaves any solvent in a freshly cleaned garment, that solvent will remove the color from the hanger and deposit it on the garment. Nevertheless, it is believed that constant usage will soon teach customers how to handle them without unfortunate incidents.

Good wedding—A happier wedding of plastics is reported to be that of polystyrene and acrylic, samples of which have been shown recently in the packaging field. Another prospect is a transparent sheet of thin gage cellulose acetate and vinyl chloride laminated together.

Vinyl paint

A water dispersion paint which contains polyvinyl acetal as the chief component has been announced by Cyril S. Kimball, vice-president of the New York chemical consulting firm of Foster D. Snell, Inc., and George O. Morrison, technical director of Shawinigan Products Corp. of New York. The new product is designated by the trademark of "Gelva."

The pigment and polyvinyl resin are dispersed in water with 1 percent or so of a synthetic wetting agent. The product can be brushed or sprayed on in the same way as an ordinary paint, and dries in less than half an hour. The developers assert that when dry the painted surface can be washed and scrubbed without harm. It can be applied to the natural surface of wood, metal, brick, plaster and wallboard or to surfaces previously coated with oil paint, and comes in a full range of colors. Although presently recommended primarily for indoor use, outdoor exposure tests show good weathering qualities.

Polystyrene sheeting

Extruded polystyrene sheeting is now making its debut in the packaging field as a box material. The oriented polystyrene sheet is flexible, tough and transparent. Polyflex is the trade name for this material manufactured by the Plax Corp., of Hartford, Conn.

The sheet is extruded, cooled to the temperature desired, then stretched longitudinally and laterally at optimum temperatures so that the sheet is mechanically strong in both directions. Thicknesses from 0.005 to 0.060 in. may be used; and thicknesses above 0.020 in. may be obtained by laminating thin sheets prior to forming.

The boxes are fabricated by the Plastics Div., Willson Magazine Camera Co. of Philadelphia, in any size up to approximately 1000 square inches. Shapes may be

FARLITE

Post-Forming Stock

This material possesses unusual properties for developing new products and applications. It combines the well established toughness of laminated plastic with an unusually economical workability. For electrical purposes it has high dielectric strength and volume resistance — for industrial uses, great strength with lightness, and for utility products a colorful pre-finished surface that resists hard wear.

Made in fabric base sheets up to 36" x 84" and 1/32" to ½" thick. Post-formed by heating the flat sheets to a temperature range of 350 to 500 degrees F. and drawing in dies of hardwood, compreg, cast resin or metal. Shape remains permanent and material will not dent or deform under ordinary blows.

Write today for further details.

Plastics Division
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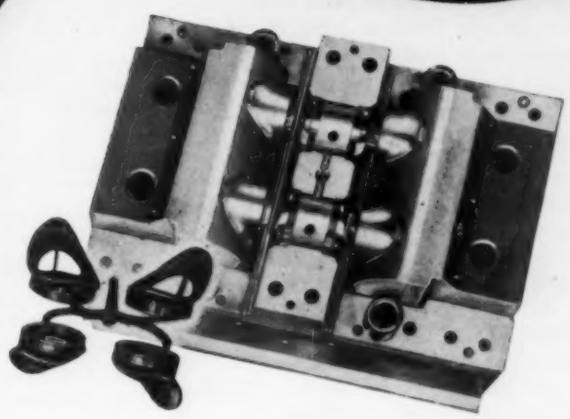
Dubuque, Iowa

3,000,000
Gleaming Pieces . . .
MOLD REDRESSING . . .
Eliminated!



If you really want to hold down costs on molds that involve a corrosion problem, look for a steel that promises *far more than* corrosion resistance. Look for high strength, good wear resistance, easy ejection, guaranteed cleanness—the *extra advantages* that spelled top results on this plastic goggle frame job. A Carpenter *Stainless* Mold Steel gave every one of these advantages—*over* and *above* protective corrosion resistance. Now look at the results: Over 3,000,000 lustrous pieces produced—*and molds have never been removed from the press for repolishing!*

Yes, low-cost performance is something you can depend upon with always clean and uniform Carpenter *Stainless* Mold Steels. Call in your Carpenter representative for complete working data, today. THE CARPENTER STEEL CO. 112 W. BERN ST., READING, PENNA.

BECAUSE THIS MOLD STEEL GAVE MORE THAN
Corrosion Resistance!

AVAILABLE FROM WAREHOUSE STOCKS!

WARRANTED CLEAN DIOK SOUND UNIFORM

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ELECTRIC FURNACE
MOLD STEELS
100% ACID DISC INSPECTED

The Plastiscope

almost as desired. It is believed that they will be particularly effective for hosiery, cosmetics, food, frozen food and dry goods. Full details can be obtained from an article in the October issue of *Modern Packaging* magazine.

Packers advertising plastics

The larger manufacturers and processors in the country are beginning to show more signs of calling attention to their use of plastics. One of the most notable is the Cudahy Packing Co., which is using color to advertise its "Delrich Margarine inside a sealed plastic bag" in *Life*, *American Weekly*, *This Week* and the general run of women's publications.

The package is produced by Shellmar Products Co. from an unplasticized vinyl-Hycar extruded film produced by the Visking Corp.

Polyethylene monofilaments

Many visitors were impressed by the woven polyethylene upholstery shown at the S.P.I. booth in Chicago last May.

Late information on this subject indicates that a full-scale production of polyethylene filaments for this purpose is many months away due to a shrinkage problem which has not yet been overcome.

The woven fabric meets all requirements at ordinary room temperature, but shrinkage is too severe for practical use at high and low temperatures.

Polyethylene pipe and fittings

Polyethylene pipe and fittings (screw type) in sizes from 1/8 to 2 in., are soon to be made available by American Hard Rubber Co., 11 Mercer St., New York 13, N. Y.

These new products are insoluble in most common solvents at temperatures up to 50 to 60° C. At normal temperatures the threaded fittings will withstand pressures up to 50 p.s.i. without leakage. In some cases they may be used at pressures as high as 100 to 150 p.s.i.

Extruded nylon strips

Nylon in extruded strip form is now being produced by the Polymer Corp., Reading, Pa. Up until this time, it has been practically impossible to extrude nylon by conventional techniques because of its high fluidity in the molten condition. Currently, strips are being offered in coil form in gages between 0.010 and 0.060 in. with widths up to 2 inches.

Nylon strip may be blanked on high-speed punch presses for small flat parts such as washers, etc., where heat resistance, toughness, resilience are important.

New latex

A new Geon latex 31X that will dry at room temperature may now be obtained according to a B. F. Goodrich Chemical Co. bulletin. The new latex will contain no plasticizer, is impervious to grease and has low moisture-vapor transmission. It is adaptable particularly for films and coatings. The resin deposited from this new latex will not support combustion and will adhere to paper, wood, glass fiber and other surfaces. It is presumed that the new latex will be of value in food packaging, paper coatings, dip coatings and adhesive applications.

A high-impact thermoplastic

A Cleveland Container Co. has been working on a low-cost thermoplastic for several years and is ready to merchandise this new product on a large-scale custom-molding basis.

The compound, called Clevelon-H, will cost the molder about 4 cents per lb., depending on the temperature and impact resistance desired.

Clevelon-H is a mixture of a thermoplastic material with an asphalt base. It has great impact strength and although color possibilities are limited, it may be dyed or painted in a wide range of colors.

As a replacement for glass insulators on telephone line cross-beams, samples of this mixture have been shown in which a high-powered .22 caliber bullet has been imbedded after firing without seriously damaging the insulator. It can be injection molded in shots even larger than 64 ounces. In addition to insulators, it has been used up to date for children's toys, banks, alphabets, number sets, fuse plugs, fence knobs, wheels, flag spear and drapery crane tips and other low-cost items. It can be painted or gilded to suit the whim of the customer and will compete in most instances with glass and wood turnings as well as many porcelain products.

Prosthetic research

The Prosthetic Research Laboratories, Pasadena, Calif., announce an entirely new synthetic material has been developed for the making of medical prosthetic devices and appliances in rigid, semi-rigid and soft, flexible flesh-color for persons wearing artificial appliances. James E. Sellers, West Coast consulting plastics engineer, formerly with Plastics Technical Institute and the War Production Board, is now the prosthetic consultant.

Plastics in Palestine

Harry Levine, plastics manufacturer of Leominster, Mass., plans a $500,000 factory in Palestine, according to a dispatch in the New York Times. Mr. Levine said $300,000 worth of plastics manufacturing machinery was waiting in New York for shipment to Palestine as soon as Britain granted import licenses.

A new standards organization

A Sink and Counter Top Manufacturers Institute with S. S. Keeney as executive vice-president and R. L. Davison, secretary, has been established in offices at 514 Park Building, Cleveland, Ohio. The organization has two classes of membership: those who actually manufacture the finished counter tops and those who manufacture the materials from which they are processed.

The first project will be to establish standards of durability and resistance to moisture, heat, abrasion and impact for the finished tops. A seal of approval will be provided to all members and its acceptance will be promoted in various ways.

A new corrosion-resistant pipe

A new corrosion-resistant pipe, consisting of steel pipe lined with Saran, has been announced by the Dow Chemical Co.

It is said to combine the basic features of steel piping, rigidity and pressure strength with Saran's resistance to chemicals. It will satisfactorily carry practically all chemicals.

The working temperature of the pipe ranges from 0 to 190° F. It is manufactured in maximum lengths of 10 ft. and in sizes of from 1 to 4 inches. Fittings, also Saran-lined, are available.

A high-grade solvent

The plastics industry seems to be especially interested in a new solvent called Tetrahydrofuran, manufactured by the Celanese Chemical Corp. and by E. I. du Pont de Nemours & Co., Inc. One neutral authority claims that it gives less viscosity with same solids content than other solvents. It is recommended as solvent for cellulose esters and ethers, vinyl acetals, chloride and acetate copolymers, alkyd resins, synthetic rubber and natural resins. It is claimed that the solubility of a vinyl chloride-vinyl acetate copolymer in Tetrahydrofuran is about 1/3 higher than that in many other solvents.

German plastics

The American-British plan for Western Germany provides a larger German capacity for plastics than prewar. About one

speeding the voice of the U. N. with RESINOX

Used by delegates and visitors to hear instant translations of the proceedings, this compact portable battery-operated radio receiver greatly facilitates sessions of the United Nations Organization.

The case of this delicate precision instrument is molded of Monsanto Resinox, versatile thermosetting phenolic plastic. Resinox meets the exacting performance and production specifications required for this application. This outstanding combination of qualities may very well qualify Resinox for your own requirements:

1. Low cost
2. Molding adaptability
3. Exceptional dielectric properties
4. High heat resistance
5. Permanent strength
6. Inherent color and finish
7. Excellent resistance to chemicals, water and aging
8. No costly finishing or coating operations necessary

For full details on Resinox . . . or the answer to any plastics question, address: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts. In Canada, Monsanto (Canada) Ltd. Montreal. Resinox: Reg. U. S. Pat. Off.

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CHEMICALS — PLASTICS

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quarter of the capacity would be made available for reparations. Considering that the German plastics industry was no pygmy before the war these American-British plans should not be taken lightly.

Tupper gets Time rave

Earl Tupper, president of Tupper Plastics, Inc., Farnumsville, Mass., received plaudits in the business section of *Time* magazine last month. Said *Time*: "Tupper received orders from American Thermos Bottle Co. for 7,000,000 nesting cups; from Canada Dry Ginger Ale for 50,000 bowls; from Tek Corp. for 50,000 tumblers; from Camel for 300,000 cigarette cases."

The mag said that he calls his material "Poly-T" "there have been too many bum articles called *plastic*" and that he had developed machinery to press it into 25 pastel shaded houseware items ranging from poker chips to ice cube bowls. An insane asylum found Tupper Ware an ideal replacement for its noisy, easily battered aluminum cups and plates. It also said that Tupper expected to gross over $5,000,000 this year.

RUMORS

The country's largest manufacturer of safety razors and safety blades is reported to be planning to follow the lead of some of its competitors and adopt plastic boxes, probably polystyrene, for its safety razors. Transparent tops will be used in all cases in order to display the merchandise.

The company has already placed on the market a small polystyrene cartridge case which holds several blades. It is a clever contrivance devised so that the user can extract a film-wrapped blade by simple thumb action. The company is also contemplating a new display arrangement which will house not only its own razors and blades, but also those of competitors.

The base of the display will be made of plastic and the top of glass, but it is hoped that a plastic top, resistant to scratching, can be devised later.

A fire hose produced from a combination of vinyl chloride and cotton fabric is said to show great promise. It is similar to the rubber-cotton combination, but supposedly will stand more abuse and be more fire resistant.

The fear that it might crack at low temperature exposure has been dispensed with, because a fire hose is not kept in low temperatures long enough to harm it, and water from hydrants does not go below 30° F., a temperature at which vinyl is not seriously affected.

According to recent publicity, the Russians claim to have developed a new plastic which is said to be 1/8 as heavy as cork. They are said to be using it to manufacture such articles as motor boats and refrigerators.

The new coated papers being sold for shelf use, which some women say can replace oil cloth in applications where wear is not too heavy, are reported to be paper that is treated with a nitrile rubber and then coated with vinyl. It has been reported that a similar-type treated paper may even be laundered. One of the purposes of the nitrile rubber in the mixture is said to aid adhesion between the vinyl and the paper.

Meyer & Brown Corp., scrap dealers in New York City, are reported to be planning a discontinuance of their plastic scrap division by the end of this year.

Paint manufacturing firms are threatening to curtail use of lead pigments because of synthetic ingredients so often used in paint. It is said that fumes from mills and smoke tend to turn some white lead paint to gray. Titanium dioxide, which has become increasingly popular, works particularly well with synthetics, according to some experts and assures a more permanent white.

RAW MATERIALS

Paraplex RG-10, another alkyd-type, polymeric plasticizing resin, intended for use with nitrocellulose, urea and melamine resins, has been announced by Resinous Products & Chemical Co. The new flexible, oil-modified polyester is low in cost, has light color, improved alcohol tolerance, good pigment stability and increased adhesion to vulcanized rubber. It resists ultraviolet light and does not spew even at temperatures as high as 325° F., according to the producer.

It is recommended particularly for high-quality nitrocellulose coated fabrics, in white lacquer for use on rubber articles and in tough, oil-resistant cable coverings.

A new fast dye for phenolic resins has been announced by the Calresin Corp. of Culver City, Calif. Nine colors in 14 shades have been developed. The curing cycle varies from 30 to 90 minutes.

Stabelon A, a new stabilizer by the Stabelon Chemical Co., 837 Buckingham St., Toledo, Ohio, is announced for use with plasticized polyvinyl halides and their copolymers. It may be used in calendering, fabric coating, extrusion, solvent solutions and dispersions. It is recommended as a stabilizer to prevent discoloration.

Phenoplast, a phenolic coating which cures at room temperature to provide a clear, chemical and abrasion-resistant surface finish on wood or other porous materials, is now on the market. It is produced by Lockrey Plastics Products Co., 40-16 150th St., Flushing, L. I. It can be applied with a brush or spray and has been recommended as a floor and furniture finish, a coating for artificial flowers or geological specimens.

Becamine resins, water-soluble urea-formaldehyde and ketone-aldehyde resins, are now offered by Reichhold Chemicals, Inc., 601 Woodward Heights Blvd., Detroit, for processing textiles, paper and plywood. They are suggested for giving dimensional stability to textiles, improving wet strength of paper, water-proofing starch adhesives, crush proofing agents for fabrics, and for hot and cold press technique in the furniture industry.

Thermo-dip N.S. is a new, transparent, low-cost, hot-melt compound for protecting machine tools, cutting gears, etc. Produced by Eronel Industries, 5714 W. Pico Blvd., Los Angeles, it is easily removed by stripping, can be re-used repeatedly and maintains its flexibility over extended periods.

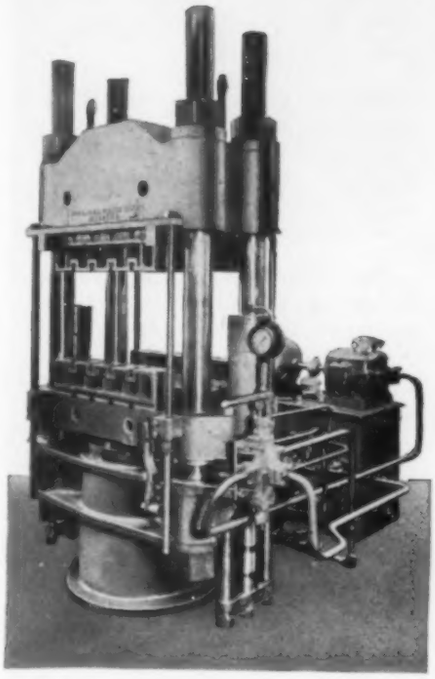
Ampreg UP-163 is a new amino resin for use in laminating paper, cloth, glass, fiber, etc. It was originally developed for the impregnation of porous materials to improve their strength.

The producer, Efam Plastic Co., Morristown, N. J., asserts that it can be applied by brushing, dipping, spraying or by the vacuum-pressure method. It cures at room temperature and has a shelf-life of over one year.

Phosphorescent Lucite resin is now available in commercial quantities, E. I. du Pont de Nemours & Co., Inc., announced recently. The luminescent form contains pigments which cause the material to glow for a period up to 12 hr. after exposure to ordinary light. Potential uses for the new material include parts of lamps, baseboards and panels for indoor light switches, signs, ornaments.

Redskin coating, developed by the Dennis Chemical Co., 2700 Papin St., St.

Presses Built to Your Requirements



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Illustrated is a WILLIAMS-WHITE Moving Up Plastic Molding Press of 300 tons capacity. It has top and bottom knockouts and die supports. Full particulars will be supplied on request.

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EXTRUSION MOLDING
INJECTION MOLDING
LAMINATING
FABRICATING
DIE CUTTING
PRINTING
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ESTABLISHED 1893

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Louis, Mo., is a protective liquid plastic coating for polished or bright metal. It may be applied by spray, brush or dipping. When dried, it forms a tough elastic film that is impervious to rust. When desiring to uncover the surface of metal, edge is picked up with finger nail and coating pealed off the entire surface in one continuous strip.

A list of high solids vinyl resins coatings for cans, closures, toys and a variety of other materials are available in a Technical Data Folder published by the Watson-Standard Co., 225 Galveston Ave., Pittsburgh, Pa. The company's finishes are intended for materials which must be coated before fabrication and which require gloss and depth.

COMPANIES

Hercules Powder Co., Wilmington, Del., has announced the following personnel changes: John M. Martin has been appointed one of two assistant general managers of the Cellulose Products Dept.

Harry E. Hartzell has been named operating assistant for the Cellulose Products Dept. after serving as cellulose acetate superintendent at the Parlin, N. J., plant since 1945.

Arthur A. Swanson of the Parlin plant is now a plastics technical service representative.

The American Molding Co., 1329 S. Vandeventer, St. Louis, Mo., formerly known as the Compression Molding Co., of St. Louis, is now under the proprietorship of Warren V. Prince in Cleveland. The company is molding phenolic croquet balls with a special filler to produce a ball that will float on water or bounce off concrete. It is contemplated that croquet mallet heads can be produced from the same material. The company is also molding street car and train car chair arms of Resin-X-Crepe.

Gemloid Corp., Elmhurst, L. I., N. Y., has appointed Louis J. Wronke as industrial sales manager in charge of the Chicago area, with offices in the Republic Bldg., 209 S. State St.

Martindell Molding Co., Trenton, N. J., has completed a plant expansion program increasing the floor space by 125 percent. Formerly an exclusively thermosetting plant, the company has now added an injection-molding department with machine capacity up to 20 ounces. M. H. Martindell, Sr., formerly general manager of the Jos. Stokes Rubber Co., established the business in 1938.

Posner Bros., wholesale distributors of notions, novelties, toys and general merchandise, have moved into new quarters at 354 Fourth Ave., New York City 10.

Holman Mfg. Co., Inc., at Hoosick Falls, N. Y., has been organized by A. R. Tinnerholm and David La Fond to injection mold custom items. These men were formerly with General Electric Co.

Centro Research Laboratories, Inc., of Briarcliff Manor, N. Y., has become associated with Chemisch-Technisch Adviesbureau of Haarlem, Holland. The latter is jointly directed by Dr. J. Rinse and W. Dorst. They are developing products such as metal putties, plastic coatings for concrete, and grease-resisting and shrinkage-controlled textiles. Their researchers are examining possibilities for new products such as air-drying urea resins; internally plasticized phenolic resins; cyclo-hexanone condensation resins and maleic treatment of oils.

The J. V. Cox Plastics Co. has been announced as successor to the Westcox Plastics Co. since the retirement of J. A. West, Jr. The new plant is at 162 Colgate Ave., Buffalo 20, N. Y.

Research Information Service, 509 Fifth Ave., New York City, has announced a new catalog giving complete translations of I. G. Farben patent applications and German government commission reports dealing with plastics. The staff is equipped to make individual translations of foreign chemical documents.

The American Plasticraft Co. has opened a new office and factory at 2027 Williamsbridge Rd., Bronx 61, N. Y.

Hellmich Plastics Co., under the proprietorship of Ernest Hellmich and his brother, is now located at 1610 Hampton St., St. Louis, Mo. Production is limited to compression molding.

aaRBee Plastics Co. of Los Angeles has opened a new San Francisco office at 116 New Montgomery St., Rialto Bldg., San Francisco, under the direction of C. Martin Welch.

The Rezolin Co., Los Angeles, Calif., is moving to a new and larger plant at 4825 W. Jefferson St.

Frank Miller & Sons has opened a new woodflour plant in Riverdale, Ill. There are six hammer mills in the plant, which is capable of producing a carload a day. They turn out 60-, 80-, 100- mesh and finer woodflour, most of which is acceptable as a plastic filler.

Howard Smith Paper Mills, Ltd., of Canada has received an order for over 230 tons of Arborite wall board (a lignin plastic) for use in the Laurentian Hotel in Montreal. They report hotel orders totaling 800 tons.

The C-Thru Products Co., Inc., has moved from East Orange, N. J., to larger quarters at 69 Lincoln Park, Newark, N. J. The company manufactures transparent sun blinds and other transparent protective devices.

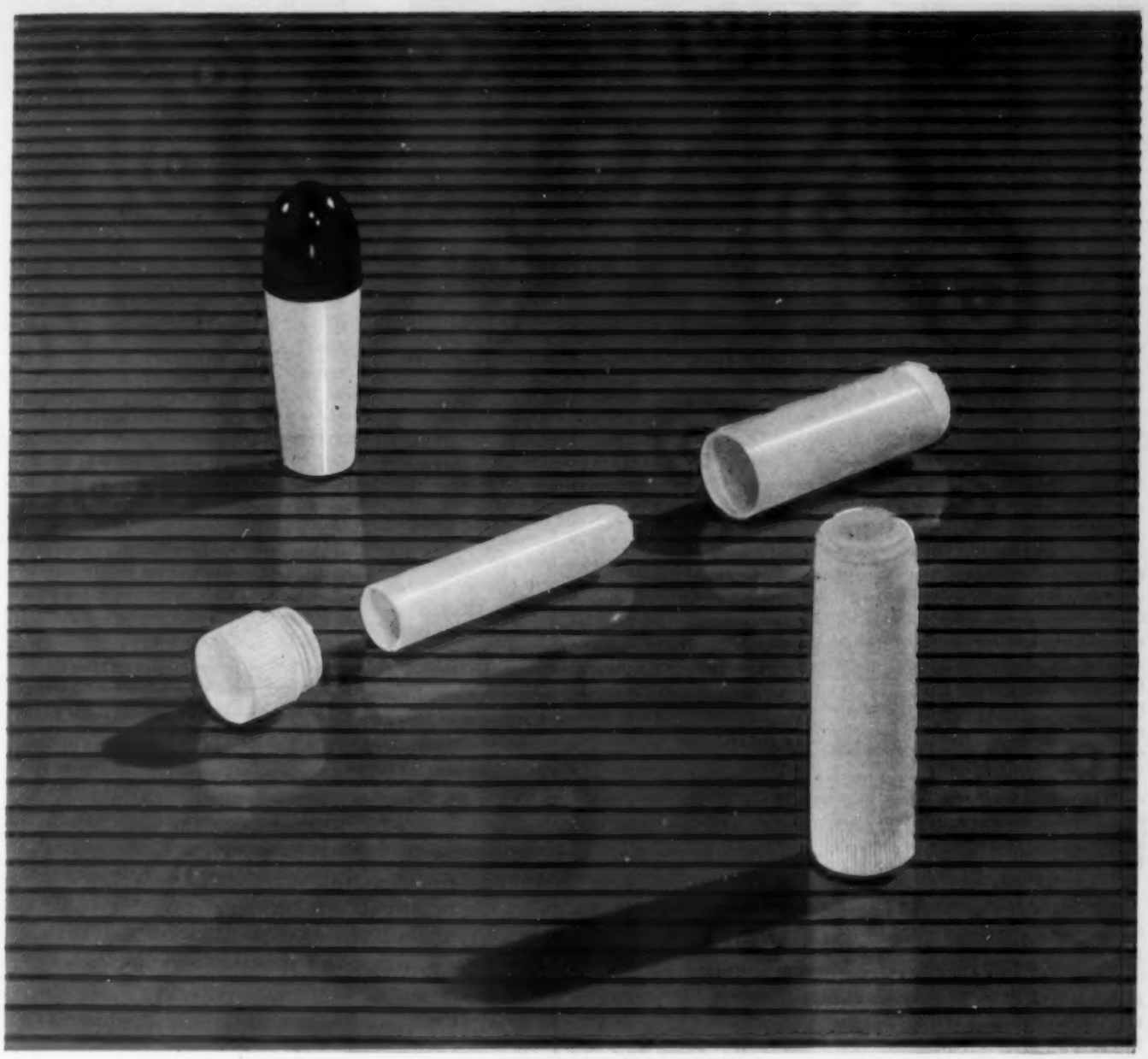
The Jas. H. Savage Associates is now located in new quarters at 20 Vesey St., New York City 7. The company is manufacturers' agent for Yardley Plastics Co. of Columbus, Ohio; MacDonald Mfg. Co., New Baltimore, Mich.; Jacobus Plastics, Inc., of Jacobus, Pa.; and Viplax Products Corp., Beverly, N. J. Viplax is a comparative newcomer in the plastics industry, managed by Jack Fenlin, who helped organize the plastics section of the Navy Department during the war. His company was organized originally to produce vinyl shoe soles but has abandoned that operation and is now engaged exclusively in vinyl extrusions of various shapes.

The Meyercord Co., 5323 West Lake St., Chicago, is exhibiting a special type of decalcomania transfer created specifically for applications to vinyl film. The decalcomania can be economically applied directly and becomes an integral part of the film, thus offering a half-tone decoration which is difficult to achieve by any other form of printing. The company asserts that their process may be used for such articles as baby bibs, aprons, containers for refrigerated food and other items.

FINANCIAL NEWS

The Dow Chemical Co. consolidated sales set a new all-time high at $130,426,838 during the fiscal year ending May 31. Net earnings were equivalent to $9.22 per share compared to $4.40 a share in the 1945–46 fiscal year, although 1946 earnings were low because of after-the-war charge-offs. Sales in 1947 were 28 percent above 1946 sales, and 4½ percent above the wartime peak of $124,570,200 in 1944–45. Plastics and related compounds amounted to 15 percent of company's total products.

Capital expenditures for new plants and equipment in 1946 totaled $84,000,000, of which approximately half was involved in the styrene plant and other facilities at Velasco, Texas. (*Please turn to next page*)



Each plastic inhaler has three precisely-made parts that fit snugly together. Order them plain or lithographed.

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Then take advantage of complete molding facilities ready to serve you *now* at Owens-Illinois.

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You get this top quality, high-speed production at low cost due to careful co-ordination of design with the exactly right molding process by O-I's expert plastics engineers.

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OWENS-ILLINOIS GLASS COMPANY

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Subsidiary companies of the parent are now listed as: Cliffs Dow Chemical Co., Marquette, Mich; Dow Chemical of Canada, Ltd. (2 plants); Dow Magnesium Corp; Midland Ammonia Co.; Brazos Oil & Gas Co., Houston, Texas and Dowell, Inc., Tulsa, Okla. Associated companies are listed as: Dow Corning Corp; Ethyl-Dow Chemical Co., Freeport, Texas and Saran Yarns Co., Odenton, Md.

Accompanying the financial statement was an interesting brochure depicting Dow's growth during the last 50 years. Significant among the items stated was the claim that from a cost standpoint, Dow had suffered severely from the war because it had to change from civilian to war goods, and the change-back will have cost the company in the neighborhood of $20,000,000. The company points out as another example of their loss that because of the need for tremendous quantities of styrene for synthetic rubber, it was necessary for the company to turn many of its developments over to industry at large, and styrene came out of the war with an over-capacity of two to three times what the U. S. could consume. Where Dow had been the only prewar producer, its war legacy was two styrene competitors using all or part of Dow's own process.

Celanese Corp. of America report net income for the first 6 months of 1947 at $11,033,445, or $1.72 per share on present common capitalization, contrasting with $7,444,403, or $1.07 per common share in the first 6 months of 1946. Sales volume for the half year increased to $84,789,014, compared to $64,663,381 a year ago.

Harold Blancke, president, declared that $17,000,000 had been expended for expansion during first half of 1947, compared with $20,000,000 for all of 1946.

Formica Insulation Co. reports operations for the first 6 months of 1947 showed net profit of $430,834. Earnings for the corresponding 6 months of 1946 were $110,711. Gross sales for the first half of 1947 amount to $6,631,819 against $3,837,860 for the first half of 1946.

United States Plywood Corp. net sales for the fiscal year ended April 30, 1947 were $43,616,109 as compared with $27,083,286 for the previous year. Net profits amounted to $5,195,100, or $3.71 per share, comparing to a net profit of $1,386,498, or $0.99 per share in 1946.

Shellmar Products Corp. announced net income for first six months of 1947 at $850,818, equal to $1.96 a common share compared with $636,587 or $1.46 a common share in the first half of 1946.

PERSONAL

J. S. Hicks, 3455 Glynn Drive, Toledo 9, Ohio, has established a consulting service in the field of low pressure plastics. Formerly technical coordinator, Plastics Sales Div., Owens-Corning Fiberglas Corp. Dr. Hicks is the author of "Low-pressure laminating of plastics."

H. J. Kasch, Sr., vice-president and one of the founders of Kurz-Kasch, Inc., Dayton, Ohio, has assumed new duties as chief consultant in charge of Research and Development. Roy H. Dean has been appointed general manager and director sales. H. J. Kasch, Jr., assumes the position of works manager; C. M. Jensen position of chief engineer. Robert L. Davidson is district sales manager of the Dayton territory.

Ray Lambert, formerly sales representative for the Monsanto Chemical Co. in New England and Southern California, has joined Worcester Moulded Plastic Co., in charge of New England sales.

Mr. William Marasco, formerly chief technician and production manager for R. E. Werner, has joined Plastics Div. Hopp Press, Inc., plastics specialty manufacturers, 460 W. 34th St., New York City.

Robt. L. Hutchison has been appointed general superintendent of Pittsburgh Plate Glass Company's Columbia Chemical Div., and for the Southern Alkali Corp. He joined the firm in 1925 and has been recently appointed superintendent of the alkali plant at Barberton, Ohio. Plants now operated by the two companies in addition to Barberton are at Natrium, W. Va., Bartlett, Calif., Corpus Christi, Tex., and Lake Charles, La.

T. F. Montgomery is the new head of the engineering section of the Plastics and Chemicals Div. of the Glenn L. Martin Co. at Painesville, Ohio. He will work under the direction of the chief engineer, Dr. W. J. Lightfoot.

Lawrence A. Bergman has joined the sales organization of Whiteford Plastics Co., Inc., 311 W. 66th St., New York City. He was formerly research chemist for Nixon Nitration Co. and also was associated with Teckna Co.

John R. Skeen has joined the staff of Foster D. Snell, Inc., consulting chemists and engineers, New York, as account executive in charge of market research. Dr. Skeen was formerly on the staff of the Bureau of Internal Revenue.

Fred Eastburn, formerly with the Dobeckmun Co., has been appointed general sales manager of Facil Fabrics Corp., Paterson, N. J. Mr. Eastburn will have headquarters in the New York office at 675 Fifth Ave.

Dr. G. F. D'Alelio has been named assistant director of research for Koppers Company, Inc., according to an announcement by Fred Denig, the company's director of research. Dr. D'Alelio, author of "Experimental plastics and synthetic resins" (1944), only 38 yrs. old, has served as director of General Electric Co.'s plastic laboratory, as director of research for the Pro-phy-lac-tic Brush Co., and, since early 1946, has been manager of the High Polymer Research Laboratory of the Industrial Rayon Corp. which is located at Cleveland, Ohio.

Graeff W. Glenn, formerly with Bachmann Bros., Inc., is now associated with the Marquardt-Glenn Corp., Philadelphia, Pa. This new company will specialize in small moldings, heat sealing, foil and Gel-Lac dipping.

W. P. Pincher, formerly of *Plastics World*, has been appointed manager of Acrilex Sales Corp., whose temporary offices are at 1812 Astoria Bldg., Astoria, L. I., N. Y. The company has exclusive rights to the casting of sheet and rod stock of acrilex and acryvin products.

MEETINGS

October 21 to 25—Pacific Chemical Exposition, San Francisco, Calif.

October 27 to November 1—Building Maintenance Supplies Exposition at Grand Central Palace, New York City.

December 1 to 6—Chemical Industries Exposition at Grand Central Palace, New York City.

December 3—American Society of Mechanical Engineers, Atlantic City, N. J.

December 4 to 6—Society for Experimental Stress Analysis, Hotel Pennsylvania, New York City. Inquiries should be addressed to the Society for Experimental Stress Analysis, P. O. Box 168, Cambridge 39, Mass.

February 16 and 17—S.P.I. of Canada at Mt. Royal Hotel, Montreal.

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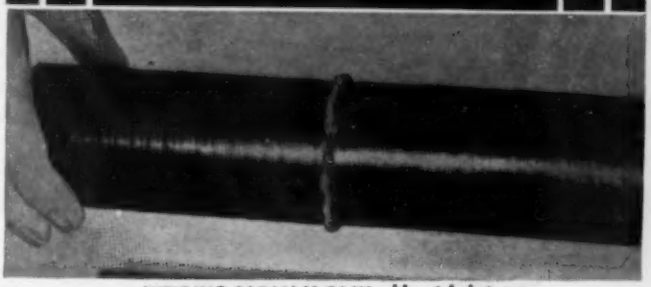

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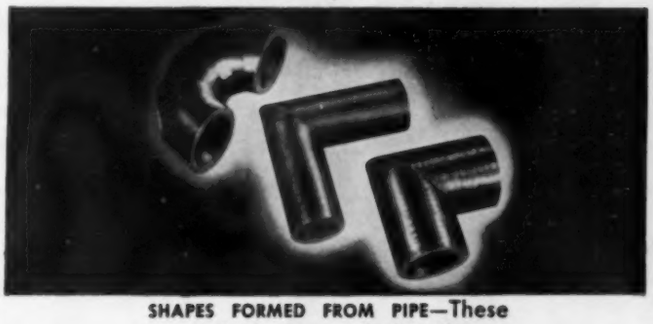

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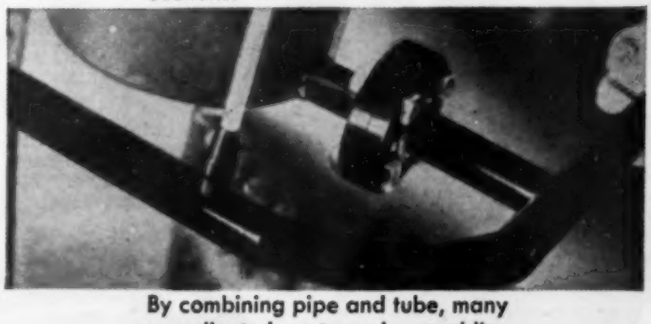

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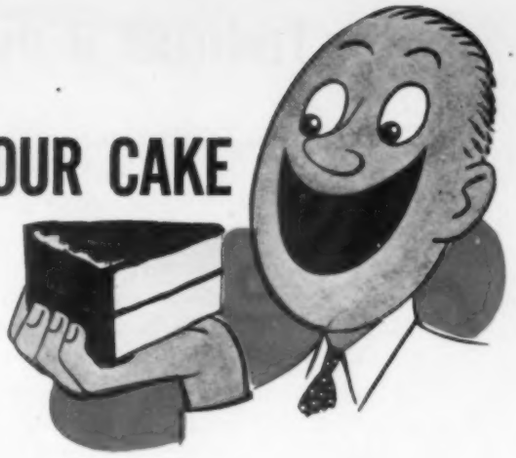
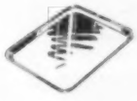


When you use KYS-ITE, you don't have to sacrifice one desirable quality to get another. You can have LIGHTNESS without loss of STRENGTH You can have a material outstandingly DURABLE, impervious to mild alkali and acid solutions — — yet a first choice for lustrous, eye-appealing BEAUTY—its sparkling, wear-defying colors are an integral part of the material  itself.

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Production of styrene

(*Continued from page 153*) ganese. This material reduces the temperature of cracking. The catalyst is packed into the tubes which are heated by gas. The amount of catalyst per unit is 2.4 tons (2 cu. m.). A back pressure of 40 to 60 mm. Hg is developed due to catalyst mass.

The ethylbenzene-water mixture at the rate of 500 l. (435 kg.) ethylbenzene per hour is preheated in a two-stage heat exchanger. The first heat exchanger is heated by reaction gases from the reaction chamber and the second by the combustion gases from the furnace. The preheated reactants enter the top of the reaction chamber which contains porcelain rings. The reaction mixture passes through the catalyst tubes, and the styrene with residual gas passes through a heat exchanger to a condenser where a mixture of ethylbenzene, styrene, water and small amounts of toluene are separated from the residual gas. The conversion of ethylbenzene per pass is 40 percent. The residual gas is passed through coolers (brine), and the condensate returned to the separator. Ethylbenzene is used to wash the residual gas and is circulated to the reactor. If the residual gases are not washed with ethylbenzene (done at 0° C.) 30 gm. hydrocarbon (chiefly ethylbenzene) are lost per cu. meter. The residual gas, now containing only 10 to 12 g/cu. m. of organic product, is added to the gas used for heating the reactor. This use of residual gas results in a saving of 30 to 35 percent (80 cu. m. gas per 100 kg. styrene were previously required).

The crude styrene is dried by pumping through a tower containing calcium chloride and then into a stirring tank where hydroquinone is added. The amount of hydroquinone is 0.01 percent calculated on styrene or 0.004 percent calculated on liquid.

Distillation of styrene

Separation of styrene (Fig. 4, page 153) from condensate obtained required a 65-plate fractionating column, but to operate this at vacuum obtainable (6 to 10 mm. Hg) means a boiler temperature of 110° C. which is too high a temperature at which to distill styrene without polymerization. Therefore, the column has been divided into two, the first with 45 plates, the second with 28. The vacuum is produced by a steam injector pump.

The crude styrene, containing about 40 percent styrene, is pumped into the first column at about the 21st plate and is distilled at 30 mm. Hg pressure with a bottom temperature of 90 to 95° C. and a pressure of 210 mm. Hg at maximum speed of operation (3000 kg. per hour). Ethylbenzene containing 0 to 1 percent styrene is distilled, condensed and in part recycled. An 80 percent styrene is collected from the bottom of the column and enters the second column at the 26th plate. Here, the bottom temperature is 88° C. and the pressure 120 mm. Hg. A further fraction of ethylbenzene containing 35 to 40 percent styrene distills at 30 mm. Hg pressure, is collected and in part recycled in the second col-

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umn and in part returned to the 21st plate of the first column.

The styrene from the bottom of the second column (containing about 0.5 percent ethylbenzene) goes to a point about one-third of the way from the bottom of a third column packed with porcelain Raschig rings. The styrene entering this tower contains about 1.5 to 2 percent residue (determined by small-scale distillation), which consists chiefly of stilbene and diphenylethane. Pure styrene (99.5 percent by refractive index) distills from this tower, and the residue is discarded. The styrene is stabilized with 10 g. hydroquinone per ton, if shipped. The ethylbenzene distilled from the first and second columns is separated from benzene and toluene in a further column. The amount of by-product benzene and toluene produced depends on the catalyst, but is about 3 percent based on styrene. Approximately 120 tons of monomer styrene are produced per one reaction unit. There were nine full-sized units and three half-sized units at Ludwigshafen. Peak production was 1000 tons per month; present capacity is 800 tons per month.

Plastic Products Addresses

(mentioned on pages 120 through 123)

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Ano-Met Corp., 138 W. 14th St., New York 11, N. Y.
Mrs. Erma Brenner, 1186 Broadway, New York 1, N. Y.
Bell Electric Co., 1844 W. 21st St., Chicago, Ill.
Boonton Molding Co., 326 Myrtle Ave., Boonton, N. J.
Breyer Molding Co., 2536 Lake St., Chicago, 12, Ill.
H. D. Campbell Co., Rochelle, Ill.
Celanese Corp. of America, 180 Madison Ave., New York 16, N. Y.
Columbus Plastic Products, Inc., 1600 W. Mound St., Columbus 4, Ohio.
Create-A-Tune Co., 118 E. 25th St., New York 10, N. Y.
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Extruded Plastics, Inc., New Canaan Ave., Norwalk, Conn.
Gering Products, Inc., N. Seventh St. and Monroe Ave., Kenilworth, N. J.
Globe Imperial Corp., 2025 Kishwaukee St., Rockford, Ill.
H. Jamison, 71 E. Sunrise Highway, Freeport, Long Island, N. Y.
Kippy-Kit Co., Circleville, Ohio.
Homer Landsdowne Co., Willoughby, Ohio.
La Cross Manicure Accessories Co., 630 Fifth Ave., New York 20, N. Y.
Lurite Corp., 449 Washington St., Newark 2, N. J.
Majestic Molded Products, Inc., 22-01 41st Ave., Long Island City 1, N. Y.
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Midland Plastics, Inc., 227 N. Water St., Milwaukee 2, Wis.
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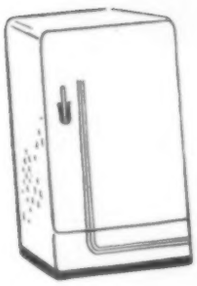
Sampsel Time Control, Inc., Spring Valley, Ill.
Sheller Mfg. Corp., S. Bridge St., Portland, Ind.
Sterling Plastics Co., 1140 Commerce Ave., Union, N. J.
Radio Tube Div., Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y.
Teal Molding Co., Inc., 87 Wallace St., New Haven, Conn.
Thayer Co., Gardner, Mass.
Victory Plastics Co., 81 Apsley St., Hudson, Mass.

Stock Mold Addresses

(mentioned on page 170)

1778-82, 84, 86-88, 90-92 Emeloid Mfg. Co., 946 Lake St., Newark, N. J.
1783, 5 Plastic Manufacturers, Inc., Stamford, Conn.
1789 Harben Plastics Co., 739 N. Spring St., Los Angeles 12, Calif.

Going Places



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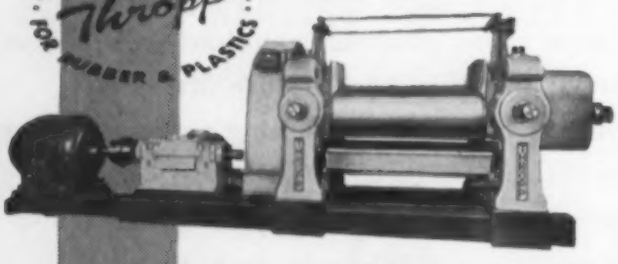

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Ethyl cellulose

(*Continued from page 158*) important plasticizer selection becomes. There were relatively few plasticizers among those tested which actually imparted to ethyl cellulose compositions improved resistance to ultraviolet light. The most effective plasticizers appear to be the aromatic phosphate esters and certain other compounds containing aromatic ring structures, such as *p-tert*-amylphenol, diphenyl phthalate and phenyl diglycol carbonate. Methyl Cellosolve stearate also performed satisfactorily, although it does not fall into the general classes mentioned.

It was noted on outdoor exposure that these same plasticizers tended to improve weathering resistance. However, the solid-type plasticizers like triphenyl phosphate and diphenyl phthalate, when used as the sole plasticizing ingredient, tended to crystallize from the film. This behavior was not shown by plasticizer mixtures in which a blend of liquid and solid plasticizer was employed; therefore, the more recent work was limited to the best plasticizer mixtures shown at the top of Table I. Outdoor exposure data on these will be discussed later in this article.

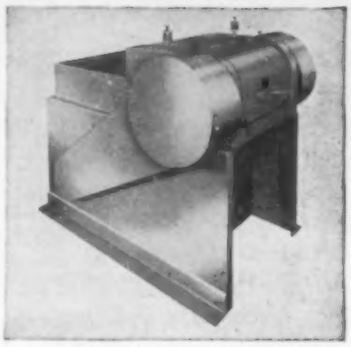
Antioxidants—The investigation revealed two large general classes of organic compounds which im-

Table VII.—Formulations for Clear Ethyl Cellulose Compositions of Greatly Improved Outdoor Durability

Films Exposed at Hopewell, Va.			
Ethyl cellulose K-100	80	79.4	80
Triphenyl phosphate	6.7	6.6	...
Flexol 3GH	6.7	6.6	...
Phenyl salicylate	6.7	6.6	...
Pentaphen	...	...	20
Belro phenol lactone	...	0.8	...
Film life—days[a]	328	328+	328+
Blushed—days	281	Hazy at 328	Sl. hazy at 328
Sheet Stock Compositions			
Ethyl cellulose K-100	88	88	
Santicizer M-17	6	6	
Triphenyl phosphate	3	...	
Diphenyl phthalate	3	...	
Phenyl salicylate	...	6	
Craze-free life in S-1 sunlamp-fog box test, hr.	80	162	
Craze-free life on fence in Fla., wk.	22	>26	
Flexibility, 6 mo. in Fla.	Flexible	Flexible	
Injection Molded Plastics			
Ethyl cellulose G-100	83.3	85.4	
Dibutyl phthalate	12.5	4.3	
Fractol A	1.7	...	
Triphenyl phosphate	...	10.3	
Menthylphenol	2.5	...	
Viscosity retention after 1 yr. outdoor weathering at Parlin, %	75	39	
Check-free life, mo.	8	6	

[a] Exposure started Nov. 9, 1943.

Cumberland Machines for the Plastics Industry



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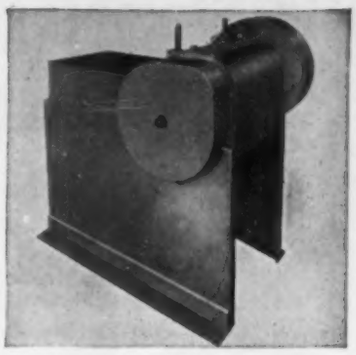

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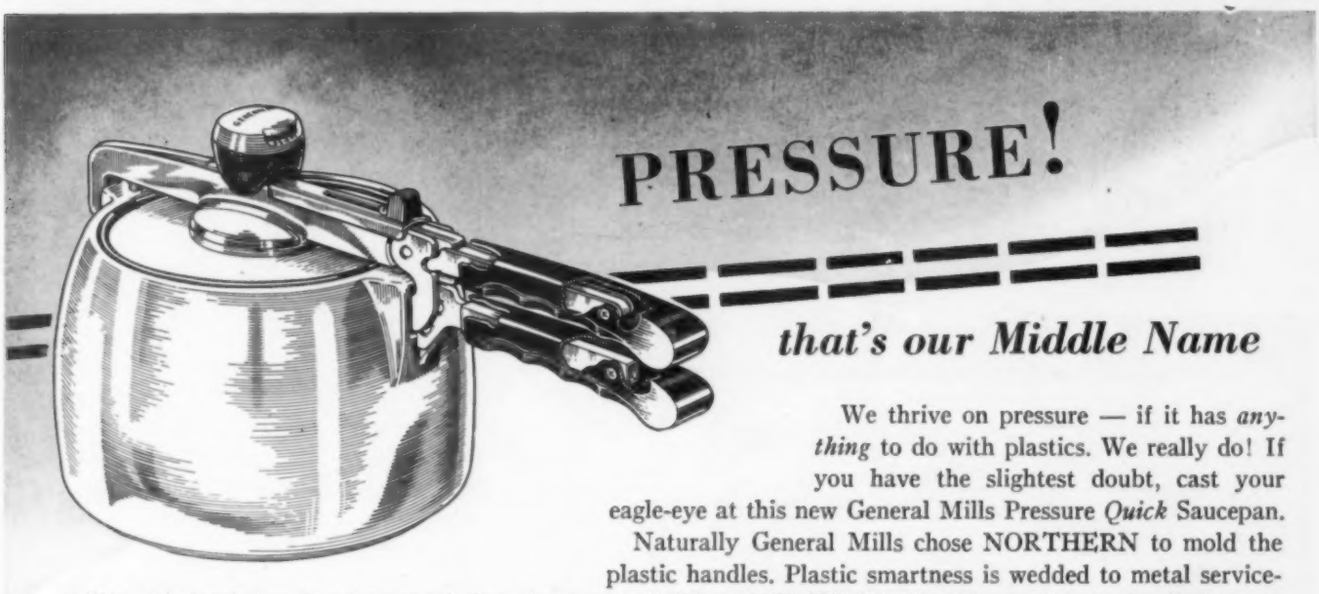

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parted to ethyl cellulose improved resistance to decomposition by ultraviolet light. These two classes included a large number of secondary amines and related nitrogen compounds (Table II, page 155), many phenolic type compounds (Table III, page 155). Most imparted improved weathering resistance to clear ethyl cellulose films, but all of the nitrogen-bearing compounds and many of the phenolics were either intensely colored initially or developed considerable discoloration upon aging. Outstanding exceptions were Belro phenol lactone,[5] menthylphenol, *p*-cyclohexylphenol and diisobutylphenol (also referred to as octylphenol by the supplier, Resinous Products Chemical Co.). These particular compounds were exceptionally free of objectionable color-developing tendency and, consequently were preferred for subsequent use in both films and plastics.

In a few instances the viscosity retention actually exceeded 100 percent. The reason for this is not clear, but it is fairly certain that such results were not due to error since the experiments were repeated several times with similar behavior in all cases.

Data in Table IV (page 156) illustrate how a few films containing phenolic stabilizing agents retained flexibility when subjected to outdoor exposure.

Data in Table V (page 157) demonstrate that ethyl cellulose upon weathering shows a pronounced loss of ethoxyl content, as well as a loss of flexibility. Phenolic stabilizing agents are seen to have a marked inhibiting action on this reaction also.

Outdoor exposure tests—It was decided at this point that sufficient preliminary data were on hand to make it possible to formulate clear ethyl cellulose compositions with reasonably good resistance to outdoor exposure. The data suggested that such compositions should contain a small percentage of an antioxidant to serve as a stabilizing agent, chosen from the para-substituted phenolic compounds. It should be plasticized with plasticizers selected from the best combinations appearing in Table I.

Accordingly, 18 selected compositions were prepared using the same lot of N-100 ethyl cellulose in all cases. With the exception of one control, which was unmodified ethyl cellulose, all films were plasticized with 14 percent of tricresyl phosphate and 6 percent of one of the following solid plasticizers: Triphenyl phosphate, diphenyl phthalate and Pentaphen (*p-tert*-amylphenol, Sharples). The proportions were selected to simulate plastic formulations. Four stabilizers were included: menthylphenol, hydroquinone monobenzyl ether,[6] Belro phenol lactone and *p*-phenylphenol. A concentration of 1 percent stabilizer based on the total weight of the composition was employed in all cases.

Table VI (page 158) gives these compositions, with a record of their weathering behavior over a 500-day period. The films were removed from the weathering racks at intervals, wiped off with a damp cloth, photo-

[5] Belro phenol lactone is not commercially available.
[6] Known as Age-Rite Alba, prepared by R. T. Vanderbilt Co., Inc., 230 Park Ave., New York City.

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graphed and returned to the weathering racks. Appreciable warpage took place in all of the samples, and it is thought that much of this developed as a result of the periodic removal of the films from the racks for photographing. This warpage accounts for bright spots in some of the pictures. Photographs of the films in the original condition and after 200, 300, 450 and 500 days exposure were made. Figure 2, which may be found on pages 156 and 157, illustrates the photographs of films from Formulae 1, 2, 3, 12, 13 and 15 in Table VI. They were selected as being representative of the group which was tested.

Increase in stability by proper formulation—An inspection of the data in Table VI shows that every formula containing the selected plasticizers, or the selected plasticizers with stabilizer, was markedly superior to the unplasticized, unstabilized ethyl cellulose film in resistance to outdoor weathering. The straight ethyl cellulose film had disintegrated within 120 days, whereas every other film was still in perfect condition after 200 days. Formulae 3, 12, 13, 15 and 16 were in almost perfect condition after 385 days' exposure. Figure 2 shows that these films still retained a surprising degree of clarity even after they had been subjected to 500 days' exposure.

A comparison of the data from Formulae 2, 7, 12 and 17 indicates that Pentaphen was outstanding among the solid plasticizers, with menthylphenol nearly as good. Triphenyl phosphate was somewhat poorer than either of these, and diphenyl phthalate was inferior to triphenyl phosphate. Undoubtedly, the superior behavior of Pentaphen and menthylphenol was due to their phenolic nature, which was found to contribute stabilizing action.

A comparison of the four materials selected as stabilizers indicates that Belro phenol lactone and menthylphenol were considerably superior to *p*-phenylphenol and Age-Rite Alba.[6] Films stabilized with either Belro phenol lactone or menthylphenol were superior in weather resistance to films which were only plasticized. On the other hand, the other two stabilizers in this series did not appear to contribute weathering resistance better than that contributed by the plasticizer alone. It should be noted that all films had become brittle at the end of the 500-day exposure period.

Additional data in Table VII (page 246) illustrates how these principles of formulation have been applied to clear film stock, to clear sheet stock compositions prepared by the conventional Celluloid process and to injection-molded plastics.

Acknowledgment

The authors wish to acknowledge the work done by Mr. George F. Pyle at the Hopewell, Va., laboratory, and by Mr. W. E. Gloor, Mr. C. A. Borton and their colleagues at the company's Parlin laboratory. Their work with plastic and film stocks served to substantiate the experimental work carried out at the Experiment Station at Wilmington, Del.

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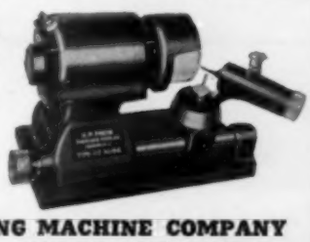

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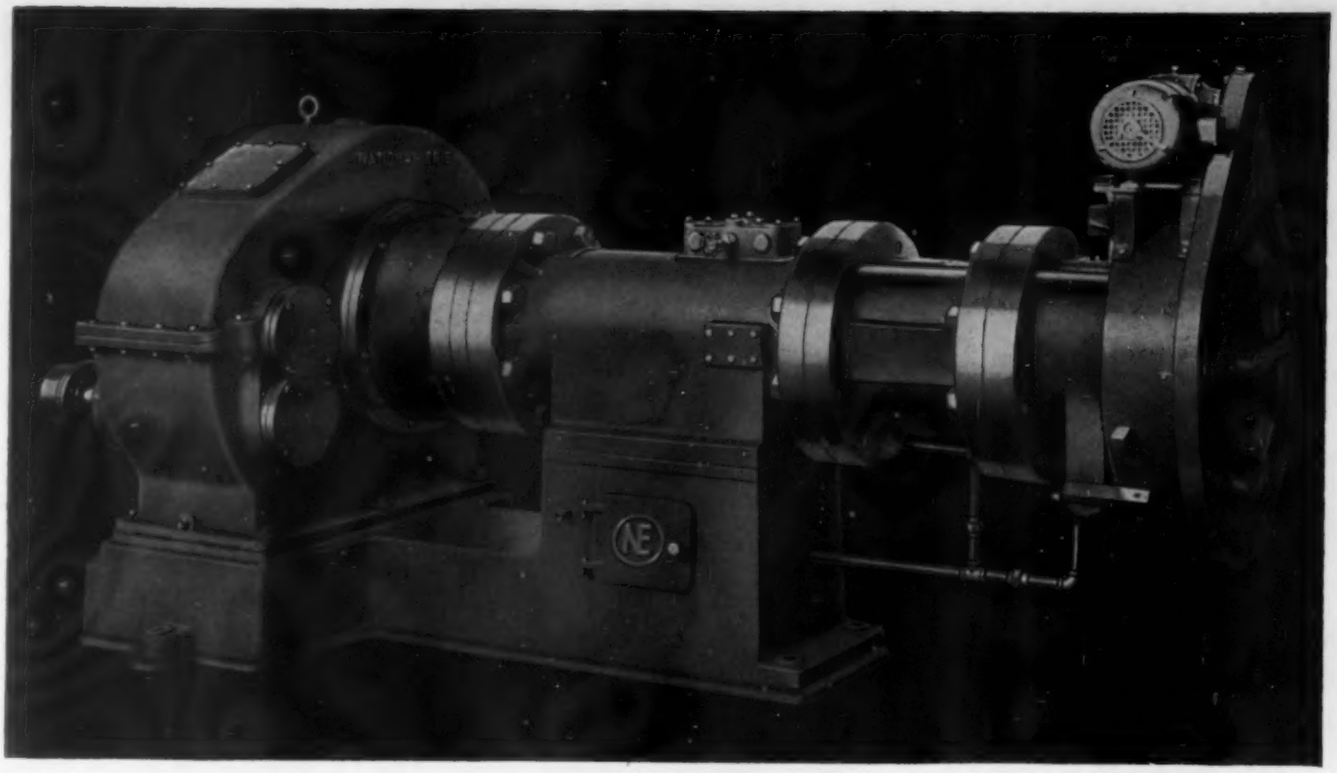

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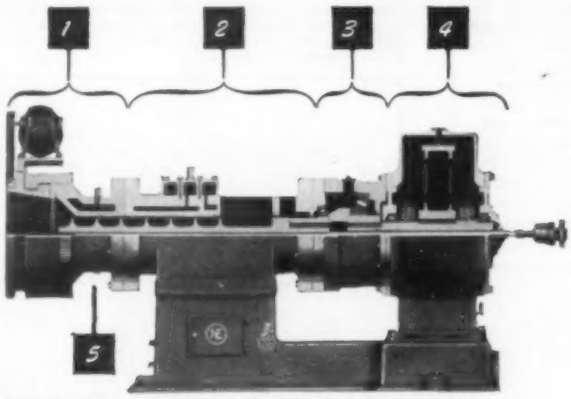

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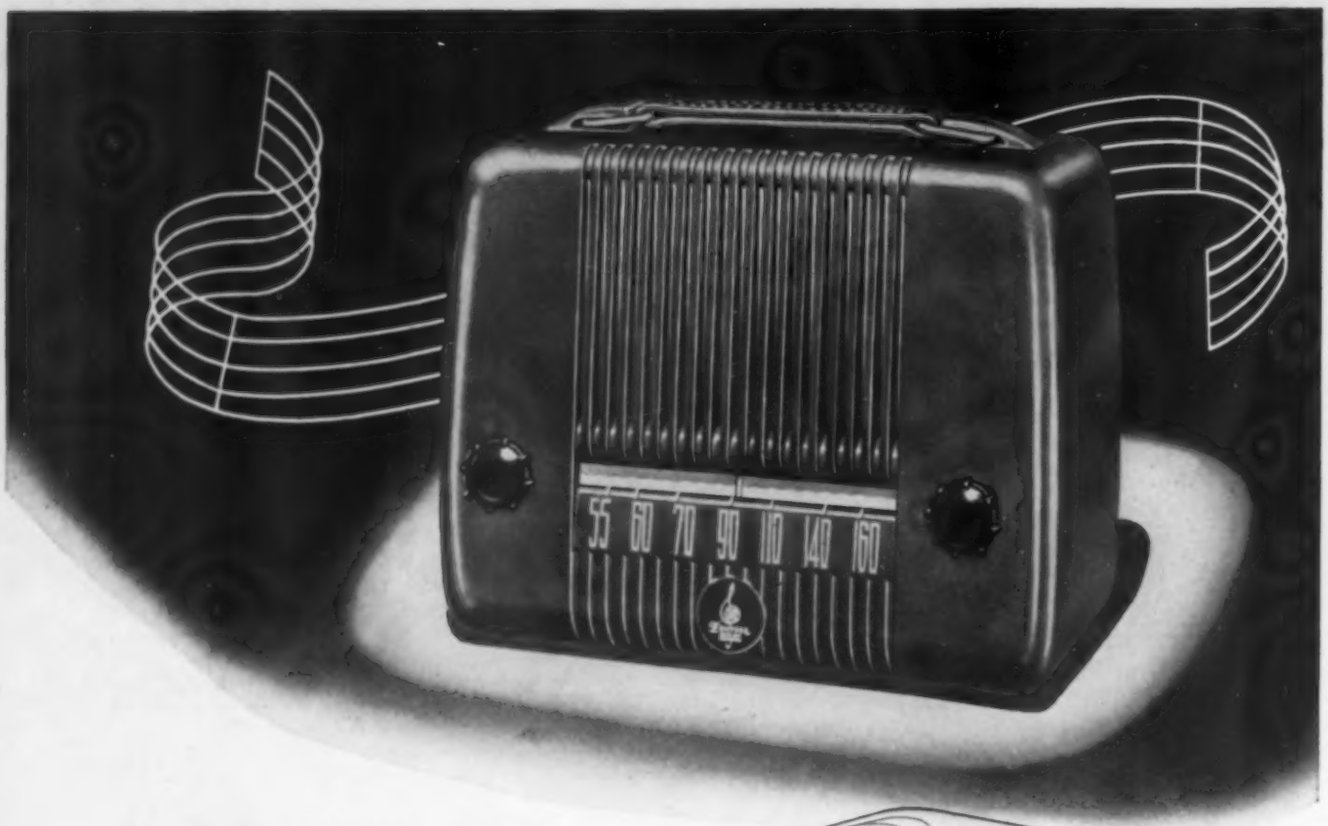

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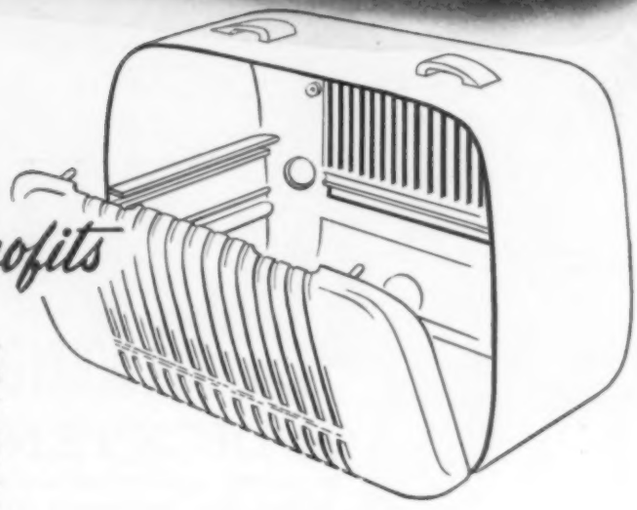

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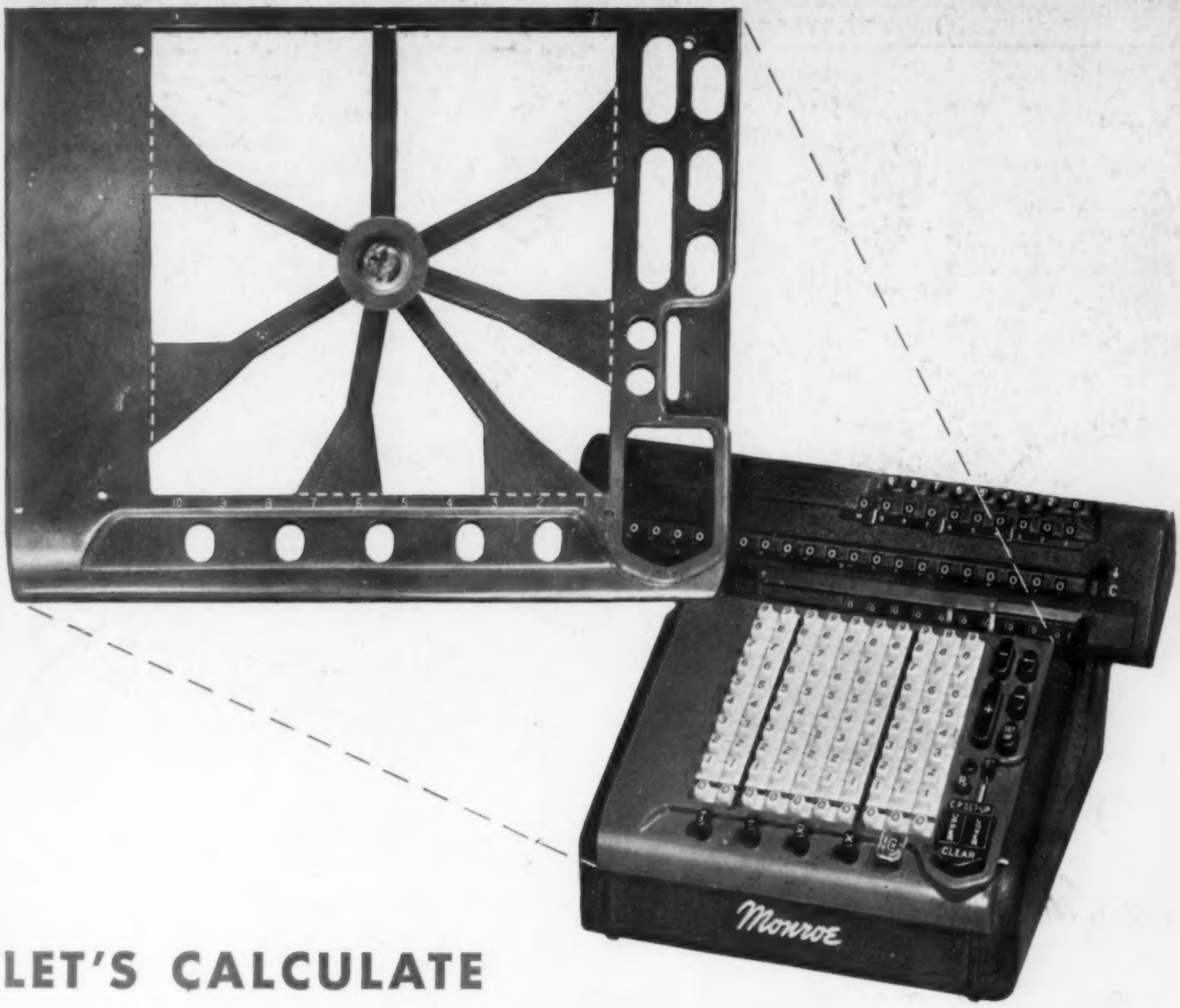

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